SKYWAYS

Is A Jet Push Home Possible?

page 10

Special Section:

JET FIGHTERS of WESTERN EUROPE

- Photos
- Complete Specs
- Performance

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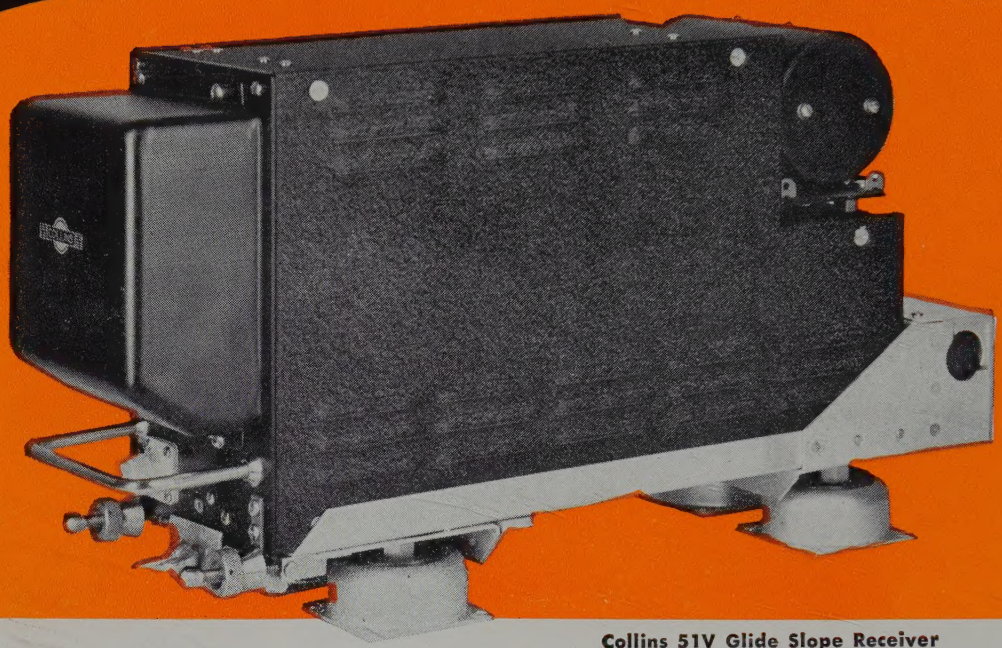

Collins 51V Glide Slope Receiver

The design of the Collins 51V-1 receiver, now on the assembly line, is based on "Glide Slope Receiver Characteristics" issued by Aeronautical Radio, Inc.

This receiver, together with the Collins 51R navigation equipment, will fulfill ILS receiving requirements for commercial and private as well as military aircraft.

The 51V is designed for reception of 90/150 cps tone modulated glide slope signals on all ten present and ten planned channels in the UHF range of 329-335 megacycles. It utilizes crystals identical with those employed in R-89B receivers and is electrically and mechanically interchangeable with modified ten channel R-89B's, greatly simplifying installation in present aircraft.

The 51V receiver control circuits are integrated with the standardized R/theta channeling system, with channel selection provided by a Collins type 314U remote control unit.

Choice may be had of a dynamotor for 12 or 24 volt d-c operation or an a-c power unit for operation from 115 volt 400 cycle supply.

If you are not thoroughly acquainted with this new glide slope receiver from previous contact or correspondence, write us for the 51V illustrated descriptive bulletin.

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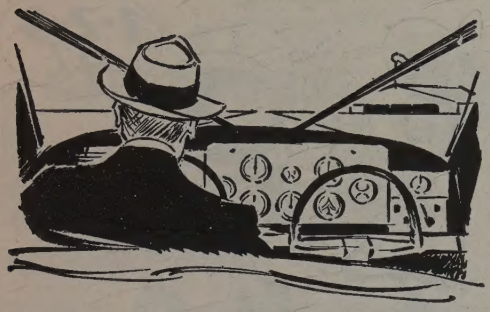

There's nothing so easy to fly on the market today as the Piper Tri-Pacer. *Head 'er down the runway and you'll see what we mean....*

That tricycle gear holds you straight as an arrow. At proper speed just ease back on the wheel to start the climb... that's your only effort on the entire take-off.

Now leave your feet on the floor for the rest of your flight—*stretch them out in solid comfort*—the inter-connected rudder and ailerons make turning as easy as in your car with wheel alone.

Aloft, if you wish, try stalling the Tri-Pacer any way you know. Never have you seen an airplane resist bad treatment so well. Little wonder the Tri-Pacer has such a remarkable safety record.

Now pop those high lift flaps and note the just-right approach angle for really accurate landings. Still with your feet on the floor, if you wish, flare out and touch down, secure with the knowledge that the tricycle gear automatically straightens out drift. Then jam on the brakes as hard as you wish.

"Here's an airplane that takes the skill out of flying," that's what you'll say, we'll bet.

PICK IT FOR UTILITY AND PERFORMANCE, TOO

THREE OTHER GREAT MODELS. Piper also makes the standard *Pacer* with regular landing gear for maximum performance, the 90 hp and 125 hp two-passenger *Super Cub* utility plane that takes off and lands in less than 50 yards, and the *PA-18-A* agricultural plane that carries 110 gals. of spray or 18 cu. ft. of dust.

Amazed by this?—you've just begun to know the Tri-Pacer. Take it out in windy weather when most other planes stay in the hangar. Taxi, take off and land with comfort in gale-force winds.

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So fly and try the Tri-Pacer yourself—your Piper distributor has the latest 1952 model ready to demonstrate it. For his name and free, handsome brochure, write Dept. 4-K.

PIPER AIRCRAFT CORP.

Lock Haven, Pennsylvania

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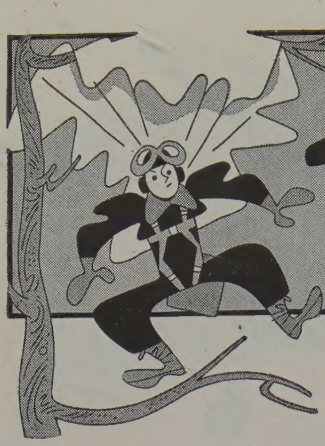
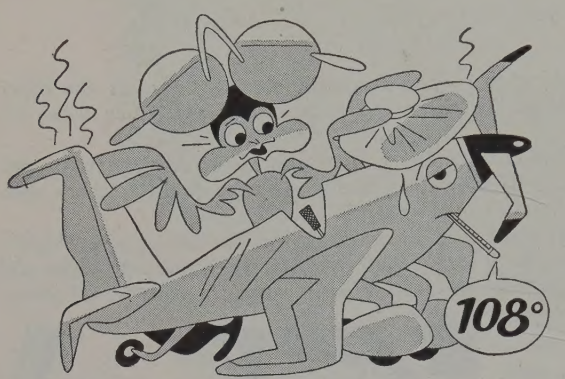


The Birdmen's Perch

Avast there, mates! All at sea about the change from mph to *knots* in weather reports? For quick calculations, this easy rule-of-thumb will give you a close-enough answer: Take speed in knots, add 15%, and you've got mph.

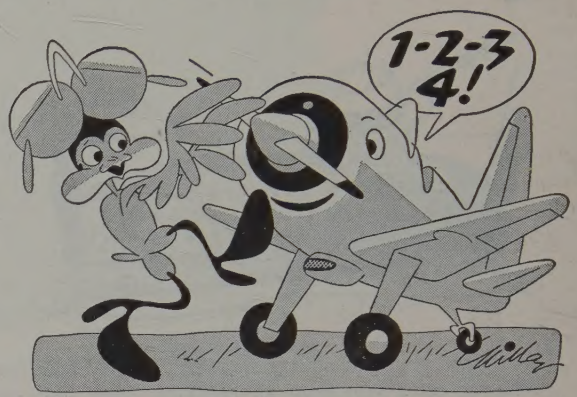


Is "hot-headedness" costing you money? "Flutter" refers, Boys and Girls, to abnormal high cylinder-head temperature. When that needle goes up, you may be getting *detonation*—and serious engine damage. What should you do about it?

Well, if you are taxiing—reduce power immediately. Be sure that your cowl flaps are open. Avoid prolonged engine run-up.

If you are in the air, reduce throttle settings and adjust for a richer mixture if your plane has a mixture control. If you do not have a mixture control, land as soon as possible for a carburetor adjustment. Open cowl flaps. If your plane has a variable-pitch prop, increase RPM.

Best friend a radial engine ever had—whether it's in frequent operation, or dead storage



For frequent operation: treat it to Gulf Aircraft Engine Oil, Series R—the very finest non-detergent, straight mineral oil for radial engines (or for any engine when operating conditions do not require a detergent oil). It's approved by Pratt & Whitney and other manufacturers for all types of service.

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P.S.: In horizontally opposed and Ranger in-line engines, use Gulfpride Aviation Oil, Series-D.

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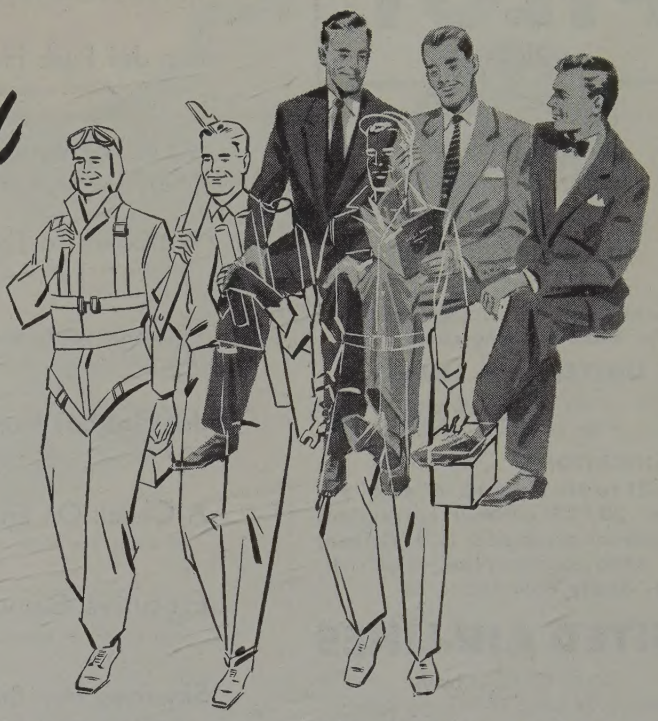

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TRAIN IN MIAMI — AIR CAPITAL OF THE WORLD

SKYWAYS

Cover: Douglas AD-5 — *April, 1952*

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GRUMMAN MALLARD

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Lockheed developed this two-place jet trainer from America's first jet fighter, the battle-tested Lockheed F-80 *Shooting Star*, proven for reliability in Korea.

America can be proud of the high standards of U. S. training, and Lockheed is proud of contributing the airplanes used to train the world's finest jet pilots.

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SUPER CONSTELLATIONS TO GET TURBO-PROPS

The U.S. Navy has selected the new R7O-1 Super Constellation as ideally designed for vital conversion to turbo-prop power. Only minimum modifications are required, according to BuAer. No structural changes of the empennage, fuselage or basic wing are necessary.

Significance to airline operators is that Super Constellations with Wright 3250-h.p. compound engines can later be converted to turbo-props. This conversion to Pratt & Whitney T-34 Turbo Wasp engines will put the Super Constellation in the 450-mile-per-hour-class.

The Super Constellation offers any airline operator any performance he desires, from high-density coach travel, to luxury over-ocean travel, or it can be used for efficient, economical cargo purposes.

Never before has the basic structure of any aircraft provided so adequately for *growth*, assuring the operator many years of competitive performance. Compared with any of today's certificated aircraft the new Super Constellation is superior in versatility, speed, payload, range and ability to earn greater profit.

NEWS NOTES FROM LOCKHEED

Eight international airlines have now ordered Super Constellations—most recent: Seaboard & Western Airlines and Braathens S.A.F.E. Air Transport ... With Navy and Air Force orders, the total demand now exceeds 200.... A new "White House Squadron" of Lockheed F-94 All Weather Jet Fighters is guarding Washington, D.C. ... Lockheed is occupied with aircraft using six different kinds of power, including reciprocating engines, turbo-props, jets and rocket power.... For pilot comfort every Lockheed jet fighter has a cockpit cooling system equivalent to 100 household refrigerators.... The single Allison jet engine in the Lockheed T-33 jet trainer is more powerful than all four engines of the B-17 bomber of World War II fame.... Pilots of many nations learn jet flying in Lockheed T-33 trainers, and recently when two T-33's were delivered to Turkey they were inaugurated in preflight Mohammedan rites including a lamb sacrifice.

FROM THE WORLD PRESS

Under the headline, "New Facts on Jet Combat," *Aviation Week* reports from Tokyo: "The Lockheed F-80 *(Shooting Star)* still is considered to be the best ground-attack jet in Korea. There is considerable belief here that development of an airplane along the proved lines of the F-80 is the answer to the interdiction-close support requirement." Thus another Lockheed design continues to prove its basic "rightness" even though more modern types have replaced it in Lockheed's production line.

AIR YOUR VIEWS

Blind Flight

Gentlemen:

In your article, "Blind Flight by Practice," you implied that the needle of the turn-and-bank indicator indicates the degree of bank (roll) or rotation around the longitudinal axis of an aircraft. I believe you will find the needle is a rate instrument, not an altitude instrument as implied in the article. The needle indicates the rate of turn (yaw) or rotation about the vertical axis of the aircraft. This can be proved by putting a ship in a constant heading slip with high degree of bank which will give instrument indications of an on-center needle and the ball on the wing-low side. The degree of bank may be obtained from the gyro horizon. In a turn when needle deflection remains constant and the ball on center, the degree of bank will vary with the change of airspeed. It follows that the needle be controlled by rudder and the ball be controlled by ailerons. One should never depend solely upon the altimeter to reveal the horizon because in a severe up-draft, if the altimeter is held constant, then airspeed will exceed normal, indicating that the nose of the ship is low, relative to the horizon. Pitch or rotation about the lateral axis is indicated by the gyro horizon and the airspeed indicator. Therefore, level flight should be resumed by attaining cruising airspeed at cruise throttle by using elevators. Rate-of-climb and altimeter should be used in conjunction with gyro horizon and airspeed indicator when resuming level flight, as added information.

I do not hold an instrument ticket and, therefore, am not an authority on the subject, but I believe you will find this information correct. Also, I noticed the *Navion* panel was displayed upside down.

RICHARD HENRY

USS Catoctin AGC5
Philadelphia, Pa.

The Navion's *panel being upside down was the result of a gremlin being on location at the printers. Final proof of that page showed everything ship-shape, but when the magazine came out .... Oh brother, thar she was! Your comments regarding the article are not only sound but worthy of readers' attention. Thanks very much for them. We are asking the author to make his comments and will get them to you soon.*—ED.

Rip Tide Competition

Gentlemen:

I don't agree with Don Downie in his article, "Rip Tide in the Sky," that the High Sierras in California produce the wildest winter in the country. For your information, Mt. Washington (6,288 feet above sea level) in New Hampshire ranks first. Wind velocities there have been recorded at 231 mph, and winds of hurricane force or 75 mph or more are recorded on an average of 134 days each year. The winter months of December, January and February average 18, 19 and 15 days of hurricane velocity, and March tops them all with an average of 21 days. Flying conditions near Mt. Washington are restricted during the winter months to an average of 60 per cent due to poor visibility and high winds. I don't believe there is any station in California that can approach these figures.

L. H. SMITH

Omaha, Nebraska

According to Weather Bureau records, Mt. Washington does register the highest winds in the nation. However, author Downie was referring to that state of wildness produced by severe up and down drafts downwind of the High Sierras, and his expressed opinion was the result of conversations with private, commercial and airline pilots who have flown in all sections of the country and who call the High Sierras "the worst." No report has reached this office concerning the vertical current velocities around Mt. Washington, and so we have no accurate basis of comparison. If you have information on these vertical currents, pass the info on to us. We are very interested.—ED.

Air Medal Clusters

Gentlemen:

I enjoy reading your magazine each month, and among the articles I read with interest in your February issue was "Combat Chasers." In the story I was amazed to read of one pilot who had received the Air Medal with 29 clusters (a cluster for each 10 missions). Damned if I don't think this is ridiculous, and I'll bet the pilot himself feels silly. Too many of us flew over 75 missions in fighters in World War II for a lot less. This situation shows the time is ripe for the Air Force or the U.S. Army to tighten up its policy to a point where this sort of nonsense won't exist anymore.

E. F. PEARSALL

Westfield, N. J.

Sentiments similar to yours, Mr. Pearsall, have been expressed by many others. While under no circumstances would we approve disregard of a military man's accomplishments, we do agree that a policy tightening up is necessary.—ED.

Bullet Speed

Gentlemen:

If a jet plane is flying at 600 mph and it shoots a bullet from its gun at a velocity of, say, 1,000 mph, does the speed of the airplane add to the speed of the bullet?

G. HOLMAN

It does indeed, Mr. Holman. The speed of a 30-cal. bullet is, for example, 2,660 feet per second .... or 1,813.5 mph. If the speed of the jet plane is 600 mph, then the speed the bullet is traveling is 600 plus 1,813.5 or 2,413.5 mph. That's fast, isn't it?—ED.

Sabre Flap . . . or something

Gentlemen:

On page 24 in your January issue, there is a picture of some *Sabrejets*. There seems to be a flap or something on the leading edge of the wing. What is it?

D. GILL

Des Moines, Iowa

I think what you are referring to, David, is the slat. A slat is a movable auxiliary airfoil, attached to the leading edge of a wing, which when closed falls within the original contour of the main wing and which when opened forms a slot. Primary purpose of a slot is to improve the airflow conditions at high angles of attack.—ED.

Needle-Nose F-94

Gentlemen:

You stated in the article "East Coast Alert," that the F-94 has a needle-nose. I am sure that isn't right.

ROBT. SMITH

Corpus Christi, Texas

Readers here couldn't spot that needle-nose reference in the "East Coast Alert" article. However, we have referred to the '94 as that on several other occasions. Specific reason why the F-94 has been called "needle-nose" is the fact that its nose is much more pointed than the noses of other jet aircraft. The F-94's air intakes are on each side of the fuselage ahead of the wing, whereas the Sabre *and the* Thunderjet *air intakes are in the nose. This smaller more pointed effect has caused aviation writers to refer to the F-94 as having a "needle-nose."*—ED.

officials estimate that the Palmdale field will have a jet flight every nine minutes night and day.

Army Twin-Bonanzas

The U.S. Army Ground Forces have contracted for the purchase of four Beechcraft *Twin-Bonanzas*. To be designated YL-23, three of the planes will be delivered to Fort Bragg, N.C., for evaluation tests; the fourth will go to Washington and into immediate service with the National Guard as a personnel transport.

Latest Scorpion

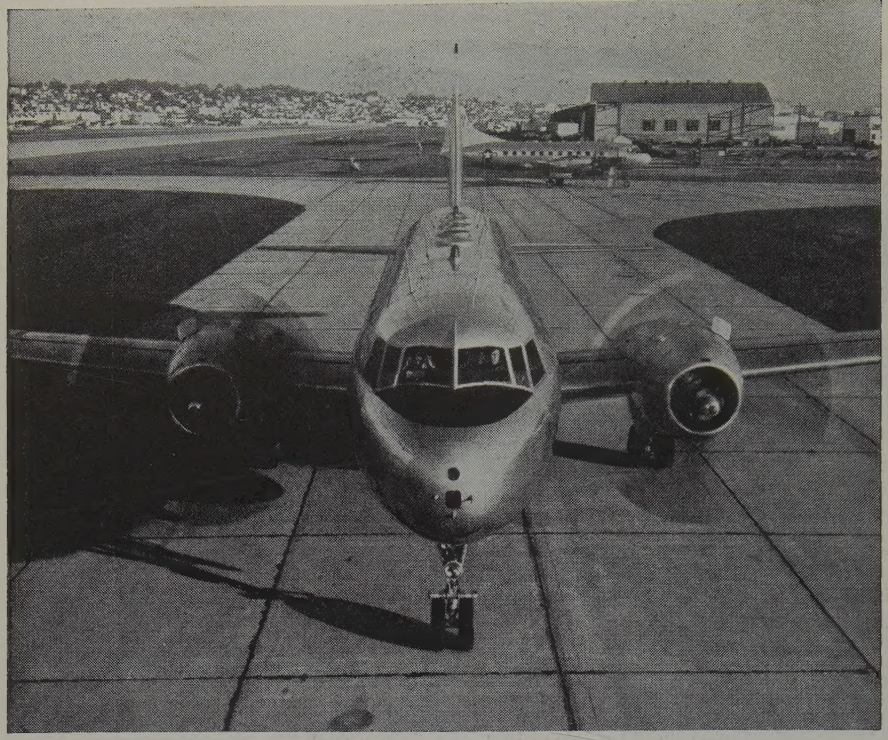
Newest in the *Scorpion* series of all-weather fighters developed by Northrop is the "D" model. Features of the F-89D include radar equipment that spots an enemy under adverse conditions, electronic aiming devices, and a tremendous punch in its power-packed rockets that can knock a bigger plane out of the sky in a single volley. The *Scorpion* "D" carries a crew of two at speed ranges up to 600 mph at altitudes above 45,000 feet.

News Notes

USS YORKTOWN ASSN. is working out plans for the Fifth Annual reunion of the men who served on "The Fighting Lady." The reunion will be held in New York City, April 25 to 27, 1952. For more information, write to: Yorktown Association, Inc., c/o George Bernard, New Equipment Digest, 60 East 42nd St., New York 7, N. Y.

DOUGLAS AIRCRAFT's Ed Heinemann, Chief Engineer, El Segundo Division, received The Sylvanus Albert Reed Award for 1951 at the Institute of Aeronautical Sciences Honors Night Dinner. Mr. Heinemann's projects have included the *Skyraider* series, the *Skyknight* series, *Skyshark* series and the *Skyrocket* series.

JOHN JEFFERIES AWARD for 1951 "for outstanding contributions to the advancement of aeronautics through medical research" was won by Capt. John R. Popper (MC), USN (Ret.). This award also made at I.A.S. Honors Night Dinner.



NAVIGATOR-BOMBARDIER trainer delivered to the USAF is this Consolidated Vultee T-29B

MILITARY AVIATION

XB-51 to Edwards

The first of two experimental XB-51 bombers has been flown to Edwards AFB, Muroc, Calif., for additional flight testing. Phase I and Phase II tests on the three-jet sweptwing plane were completed at the Glenn L. Martin Airport, Baltimore, Md. The second XB-51 is scheduled to go to Muroc and the Air Force in the near future.

Neptunes to England

Two Lockheed P2V-5 *Neptunes* were delivered to Great Britain recently for service with the Royal Air Force. These are the first of a fleet of P2V's which this country is furnishing to Great Britain under the Military Defense Assistance Pact, and will be used for anti-submarine patrol by the Coastal Command of the Royal Air Force. The P2V-5 is the latest model *Neptune* which, in addition to the heavy armament of previous models, features a new nose turret armed with cannon, wingtip tanks that carry radar and a searchlight as well as fuel, and is powered by the new Wright Turbo Compound engines, generating 20 per cent more power than the standard version of the same engine.

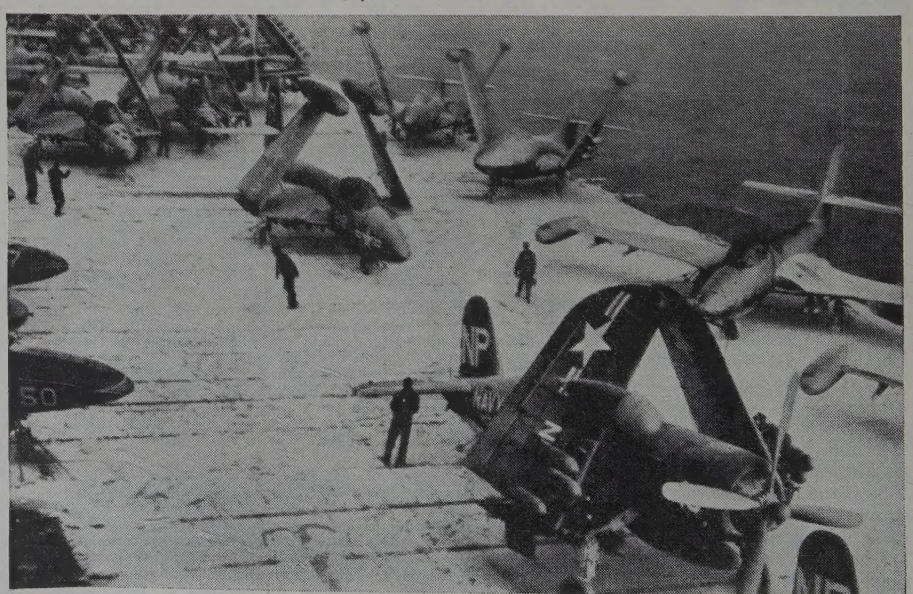
Fuel-Eaters

The American Petroleum Institute has given some interesting figures concerning the fuel needs of military aircraft. The B-29 of World War II consumed 440 gallons of gasoline an hour, whereas today's biggest bomber, the B-36, burns 980 gallons of gas an hour. World War II's P-51 (now F-51) lapped up fuel at the rate of 63 gallons an hour, while the F-84's, currently in use in Korea, consume 355 gallons an hour!

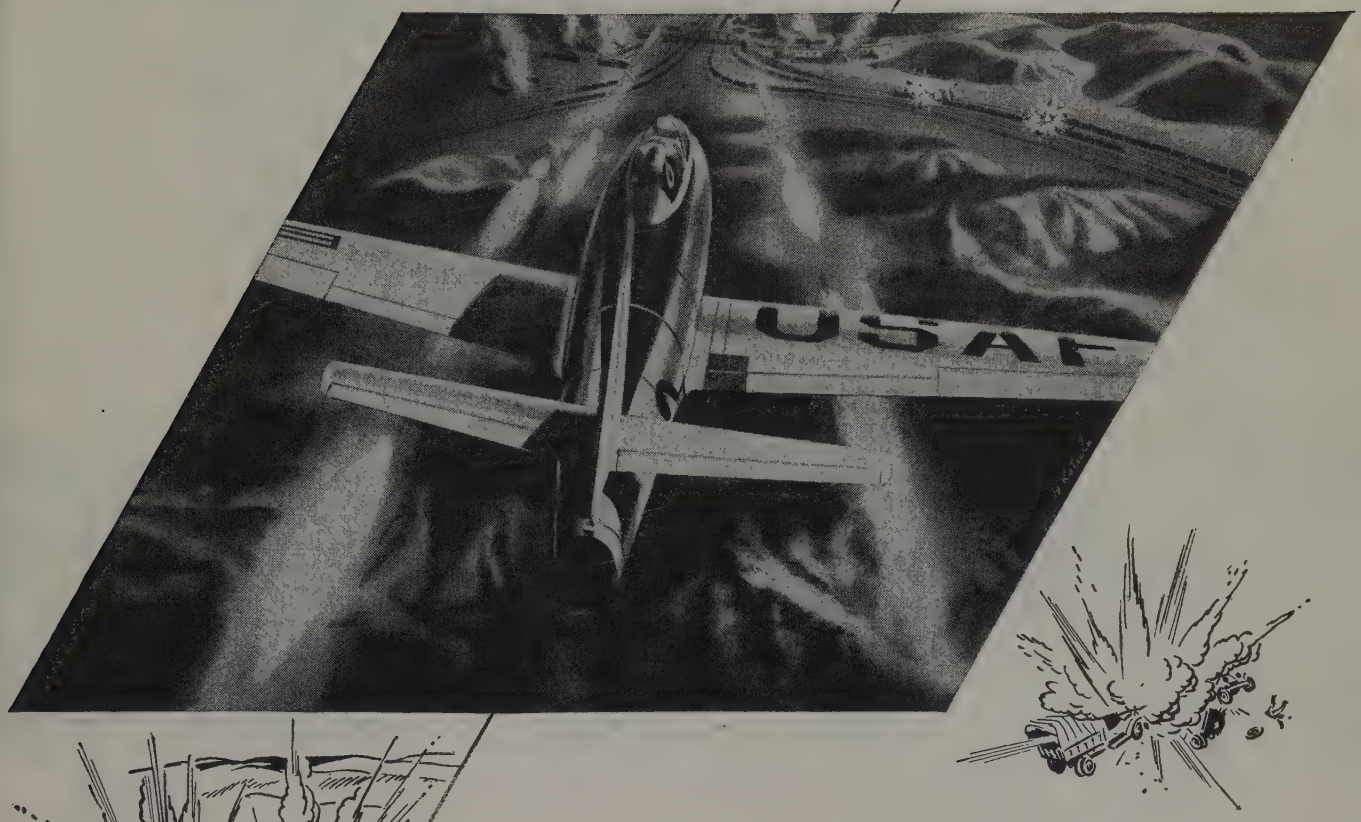
Jetville, USA

Lockheed launched first production operations at "Jetville, USA," recently. A section of desert land at Palmdale, Calif., this area is destined to become a world center of jet aviation. Lockheed will run flight tests on current F-94 models for the present, but it will eventually be the scene of test flights on newer jet designs. Ultimately, Northrop and North American will join Lockheed at this $30,000,000 jet center, the location of which was chosen by the Air Force. AF

FLIGHT DECK covered with snow, planes of *USS Essex* wait for lull in storm to take off



INTERDICTION....



It's a fine word ... it describes a great military concept ... it is the use of air-power to strangle aggressor forces by destroying their supply lines. Interdiction isolates the fighting enemy from his support. ➢➢➢ Greatest effective weapon to wage successfully this phase of warfare ... as a combat tested, fighter-bomber in Korea, the Thunderjet has proven its ability to carry out the multiple requirements of interdiction.

REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, N. Y.

Makers of the Mighty Thunderbolt • Thunderjet • XF-91 • F84F

AIR FORCE jet F-80 pushing a flamed-out F-80 home would look like this, as sketched in by an aerodynamacist

CLOSE FORMATION is flown by Air Force pilots in these F-94's being ferried to Alaska at 30,000-foot altitude

Is a Jet Push Home Possible?

By DON DOWNIE

COULD the old-fashioned "pusher" airplane suddenly be a brand new idea in jet aviation? Don't be quick to say, "No," here.

Can one jet airplane push another one home after the lead airplane has had a power failure? Many of the F-94 Interceptor pilots of the Alaskan Air Command believe that it can be done.

One of the many wild and wondrous stories making the rounds in Alaska is about the F-80 pilot who had a flame-out at 30,000 feet over the polar ice pack. His wing man was supposed to have jammed the nose of his F-80 into the tail pipe of the crippled aircraft and pushed him home.

We originally reported the story—only as a fictional—in SKYWAYS (*F-94 Ferry Flight*, October 1951) and the material was cleared by both the Alaskan Air Command and Washington, D. C.

"Perhaps that pushing story came out of a 'gin mill,' " said Capt. Conrad L. Johnson, an F-94 pilot from Fergus Falls, Minnesota, as four of us sweat out the weather at Fort Nelson in British Columbia, "but I think enough of it to give the idea a try if anyone in my flight is ever in danger of going down on the ice pack."

The other two pilots in his flight, Captains Roy A. Barnes of San Francisco, California, and Joe Wisby of Springfield, Missouri, nodded in agreement. They, too, would try anything in an emergency.

"I wish that I knew a little more about theoretical aerodynamics," said Capt. Wisby. "I believe that we *can* push one of these fighters, but I'd like to know a little more about what's going to happen when we try it."

Upon returning to the States, we talked with some of the better brains in the aerodynamics sections of the Southern California aircraft factories. Most of them chuckled at the reported pushing as a good story and laughed it off. However, a few of the older aerodynamacists didn't laugh. They wanted all the information there was to be had and tried to authenticate the story from their own factory sources.

"We couldn't find out who did it," said one aerodynamacist, "but with proper investigation and careful pilots, it is possible."

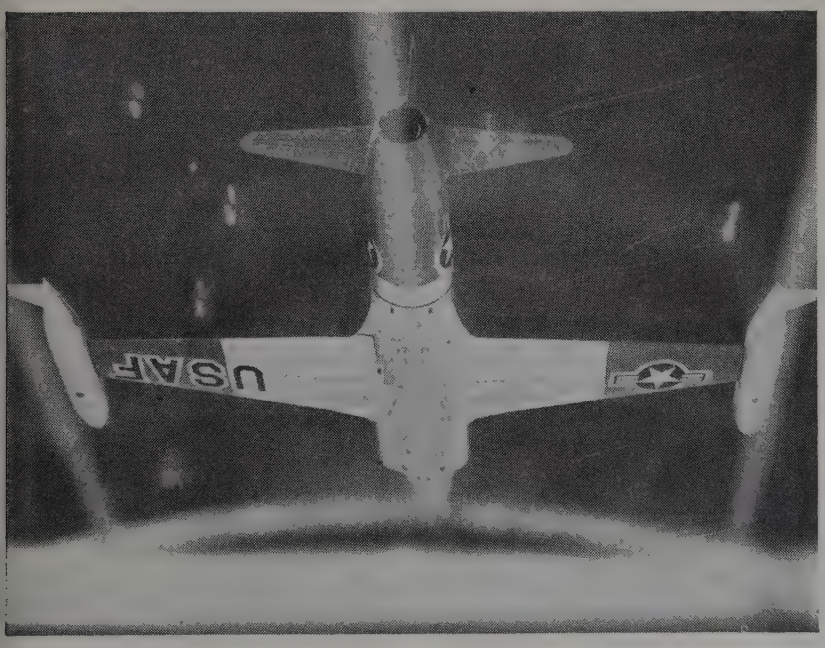
At press time, a telegraph from the Alaskan Air Command stated, "Impossible to authenticate." So perhaps this pushing never happened, but who can say it won't someday.

The consensus of opinion among aeronautical engineers is that it is possible. So let's delve a little farther into the jet-pusher idea and see what happens.

"It would take a crew of four or five good aerodynamacists at least four or five months to completely check the extremely complicated problems of this pushing for each type of aircraft, so I would rather not be quoted by name on these ideas," said one of the top stability and control men in California, "but from a quick check of the problems, here's how it would work."

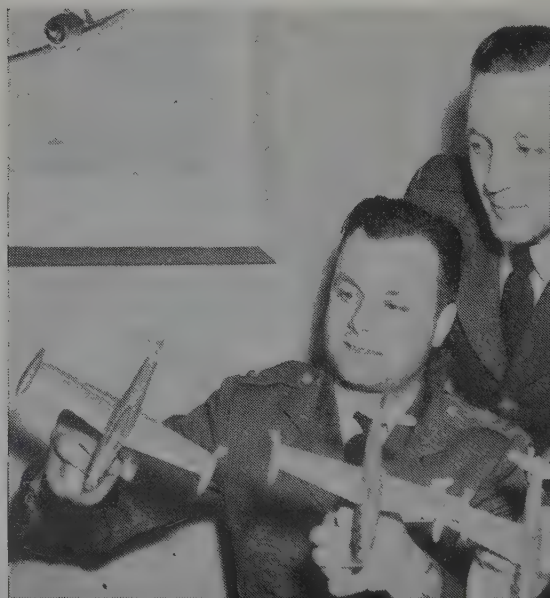
With a long slide-rule in one hand and a (*Continued on page 40*)

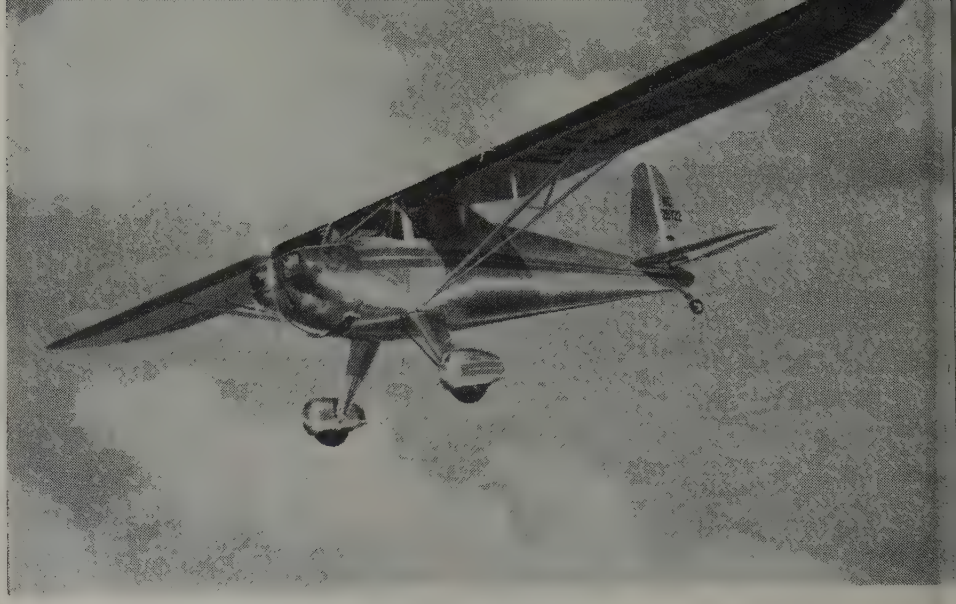
JET PILOT flying behind an F-94 has this view of the F-94 above him



According to report, a pilot nosed his F-80 into tail pipe of crippled jet and pushed him home. "Not impossible!" say aerodynamacists

IMPOSSIBLE was done by Lt. Wood McArthur *(below, right)* and Capt. J. Miller (still in Korea) to save Capt. Paladino *(below, left)*. Using model F-84's, the men show how it was done





AIRPLANE'S bank too shallow, less lift is used for turning and more "g's" are required for that turning radius. The more "g's," the more back elevator. This leads to the plane's stall

It's in the Bank

. . . or is it? This writer claims a stall is caused by number of "g's"

"Most pilots think that the stalling speed increases with the angle of bank. Actually the angle of bank has nothing to do with it." This statement, made by me in an article in the September 1949 issue of SKYWAYS by Dana Crawford, caused a major ruction among many students of the art of fine-flight technique even though it was qualified with the additional explanation. "It is only the acceleration or number of 'g's' that causes the stalling speed to increase. This acceleration can be applied in any degree of bank or with the wings level."

It's easy to understand why this is practically the talk of a "traitor." For years text books and manuals on flying have had neat tables showing how the stalling speed goes up with angle of bank. For decades, instructors have pounded into their students the "law" that the steeper the bank, the greater the stalling speed. I disagree.

In fact, I'll really shock some text-book pilots by stating flatly that the stalling speed for any *given* turn *decreases* with steeper bank.

As an example, let us consider a turn of 350 feet radius made in an airplane that is flying at 80 mph. The airplane has a straight-and-level flight stalling speed of 60 mph. If this airplane were to make the turn at 45° bank, the stalling speed in the turn would be 80 mph. If the airplane were to make the turn at 55° bank, the stalling speed in the turn would be 73 mph.

The mistake made by many pilots is the assumption that one must not lose altitude in a turn. Any good, safe, low-altitude turn should involve a slight loss in altitude. In the above example, increasing the bank for the turn by 10° would prevent this airplane from stalling out of the turn. This over-bank loses 90 feet of altitude. Believe me, if you *have to* make such a turn at low altitude (such as for a forced landing) *over-bank it!*

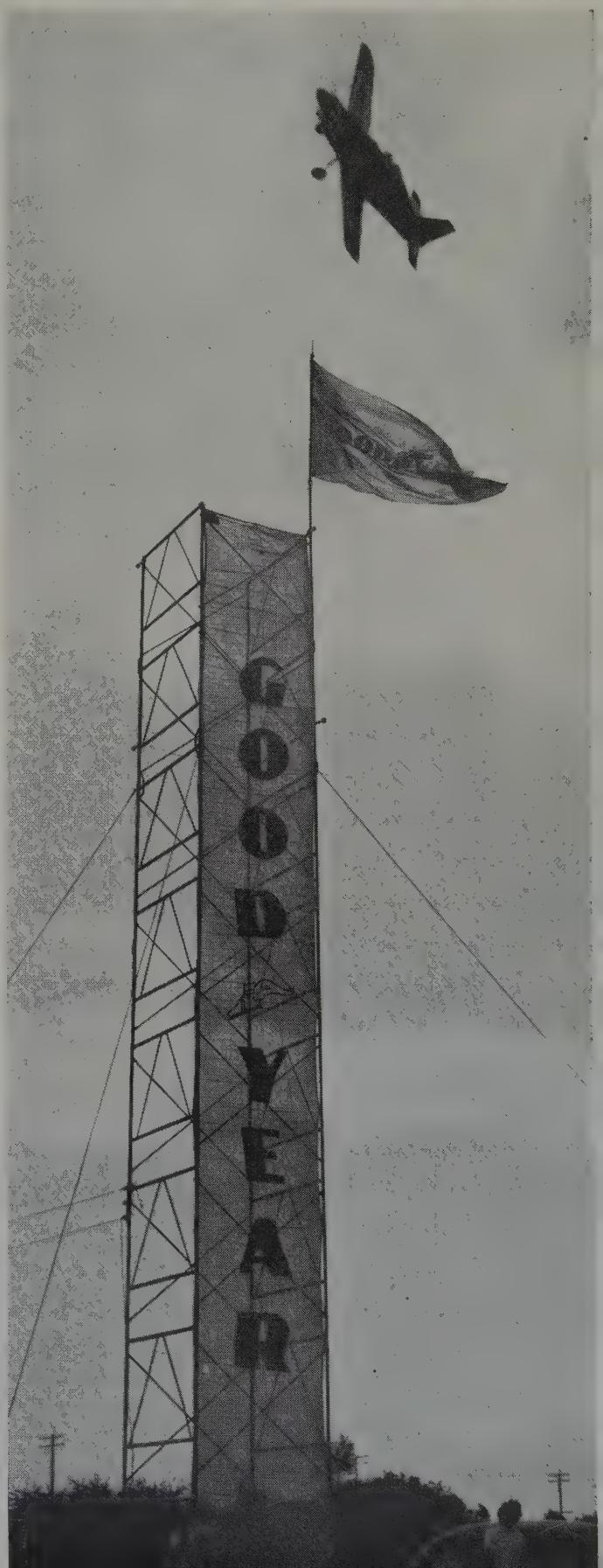
Mr. Crawford's article was written with my collaboration. It included many items which were the result of my specialization in the field of preventing stall accidents. The statement did not originally appear in some technical article to prove some obscure point of aerodynamics. Talking about proving an obscure point, the tables of stalling speed *versus* angle of bank do exactly that. They are based on an impractical assumption about long-time equilibrium conditions, and they mislead pilots into *under*-banking turns. The first author who calculated the stall speed vs bank tables forgot to take into account the same thing that keeps a baseball aloft between the pitcher and home plate. Newton called it momentum.

The next time you fly, try a little experiment. Climb to a safe altitude for stall practice and *reduce your airspeed to not more than 50 per cent over stall speed* (to stay well away from over-loading the wings). Now pull back rapidly on the controls until the SFI sounds or, if not so equipped, until the airplane stalls. Then try the same thing with shallow bank, very steep bank, nose high, nose low, crossed controls, and any combination of these. You will notice one thing: it is not the bank, nor the crossed controls, nor the airspeed, nor the nose high, nor the nose low, nor anything *but the back position of the elevator controls* that causes the stall.

Now let's get on to the main cause of confusion. It is this little table which is put out listing stalling speed against angle of bank. It is only natural for the pilot to look at this table and say to himself "OK, so I won't bank steeply and I won't stall."

AUTHOR maintains that if pilot let nose fall off in well-banked turn, instead of under-banking and using elevator to get around, stall accidents would be prevented

LOW-ALTITUDE TURN, such as this midget racer's pylon turn, is safer if nose is raised slightly entering turn, avoiding too much back elevator, even if nose drops



By Dr. Leonard M. Greene

President, Safe Flight Instrument Corporation

Ten minutes or 10 years later, he stalls in from an under-banked low-altitude turn.

Why? The answer lies in what does the actual turning of the airplane—it is the pointing of the wing lift toward the center of the turn. This pointing is done by banking the airplane. When the bank is too shallow, less lift is used for turning, and more "g's" are required for that turning radius. The more "g's" the more back elevator—and we have just discussed that it is back elevator that causes the stall.

You may ask "How can I prevent losing altitude if I used some of the lift for turning?" The answer is that a good safe low-altitude turn should lose a small amount of altitude (or climbing rate, as the case may be). If pilots had made it a habit to let the nose fall off in a well-banked turn, instead of under-banking and using elevator to get around, many stall accidents would have been prevented.

One more point about losing altitude in a turn. These 360° and 720° turns, which require that long-time equilibrium conditions exist, are about as useful as a dog chasing his tail. A 90° turn is as much as you will have occasion to use unless you are buzzing . . . and we don't buzz, do we? Try some well-banked 90° turns, raising the nose slightly to enter the turn and avoiding too much back elevator, even if the nose drops slightly. You will find that you can perform it with a negligible loss of altitude and yet stay much farther away from a stall than by using a lesser bank for a turn of the same radius.

Recently, in a friendly discussion with a pilot about the "facts of life" (*Continued on page 40*)

Watchers to the West

WESTERN AIR DEFENSE F-89's stand on the line at Hamilton Air Force Base ready to take off on a scramble mission to intercept unidentified aircraft. Pilots get the F-89's up and away in about five and a half minutes

COMMANDER of 78th Fighter-Interceptor Group at Hamilton AFB is Col. Jack W. Hayes, shown here with his F-84

Western Air Defense Force guards western U.S. from Canada to Mexico

By ALBERT S. BURCHARD

The general, tall, lean and graying at 44, gestured toward the window behind his shoulder. "That," he said, "is the challenge of this job—the sky.

"The job of air defense," Brigadier General Hugh A. Parker continued, "is as big as the sky. They could come at us on the deck or 50,000 feet up, and from any direction. It doesn't matter how good our planes are or how fast our pilots can get airborne. You've got to find them before you can start fighting them."

And that's just what Parker and the other members of the Western Air Defense Force team figure on doing.

"Team" is the right word to use in describing the outfit. Its members range from Major General Walter E. Todd, scheduled to take over command this month, through vice-commander Parker and right down the line to the volunteer civilians serving without pay on the lonely hills of California's rugged coast.

These are the people charged with protecting the whole western area of the United States. Their territory includes 1500 miles of coastline, boundaries

with Canada and Mexico, and the lives of 21,500,000 people scattered over 1,190,000 square miles of country which varies in elevation from the lowest to the highest points in the whole nation.

As if the lives of those 21 and a half million people weren't enough, they have added stimulus of knowing that those 1500 miles of coastline hold the five major port areas of the West; there are huge industrial complexes, including the tremendous aircraft center around Los Angeles; there are the major sources of the West's critical hydroelectric power—Hoover, Shasta, Grand Coulee; two great atomic energy developments; oil; timber; the transportation net.

The job of the WADF is to see that, no matter how an enemy feels about it, these functions go on.

It isn't a glamorous job. Except for the jet jockeys, there isn't a single task which, in itself, is dramatic. There's nothing romantic about huddling over a radar screen or sleeping by your anti-aircraft gun in a drafty, cold, snow-covered hut on top of a mountain somewhere. There's nothing that catches your imagination in changing the tubes of somebody's ultra high frequency transmitter.

Not dramatic at all—but vital.

For if these people get off the ball at the same time an enemy wants to strike by air, the West Coast has "had it," that's all. It's as simple as that.

The principles of air defense are simply stated: detection, interception, identification, destruction. There's nothing hard about understanding the terms, but carrying them out is something else again. During the Battle of Britain, one of the best air defenses the world has ever seen could account for only about 8 per cent of the Nazis' attacking planes. The Germans themselves could shoot down only about 4 per cent of the planes we put over their cities.

Detection means radar and civilian volunteers. The West Coast's radar net begins with Navy picket ships rocking in Pacific Ocean swells at secret location out to sea. To the north, Canada's lonely outposts are our first line of defense, through working agreements with the Canadian government. In the United States itself, the big basket antennae wave from high peaks ringing the whole United States.

The system probably isn't foolproof, but it's pretty good. There are deadspots, since radar is line-of-sight, behind the hills and through the valleys. This is where the civilian volunteers get into the act. They have their own observation posts throughout the West, and their own filter centers to correlate reports.

FLIGHT TRACKS are reported to Ground Control Intercept unit, which has a record of all proposed flight plans

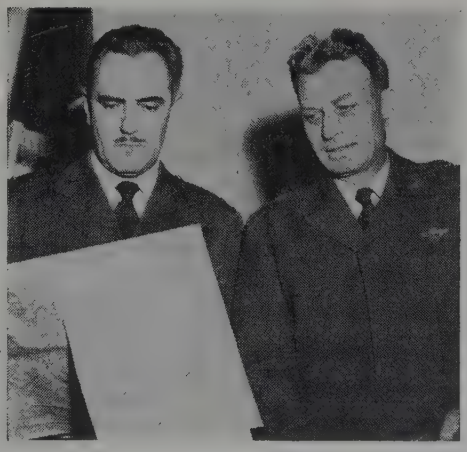
In California, the Ground Observer Corps is about 60 per cent organized now, according to Captain E. M. Johnson, of Fresno, Calif., who has charge of plans and training of GOC for WADF. That means he has people signed up and undergoing training to man about half the posts and give him a half-complement at the filter centers.

General Parker, too, stressed the importance of the civilian ground observers. "They can play a very important part in our air defense," he said, "but we need more of them."

Ground observers can volunteer at local civil defense posts. They will get a minimum of 30 hours' instruction per year if they are actual observers, or 50 hours if they are going to man filter centers. The Air Force takes care of training, but the civil defense agencies do the administrative work connected with them.

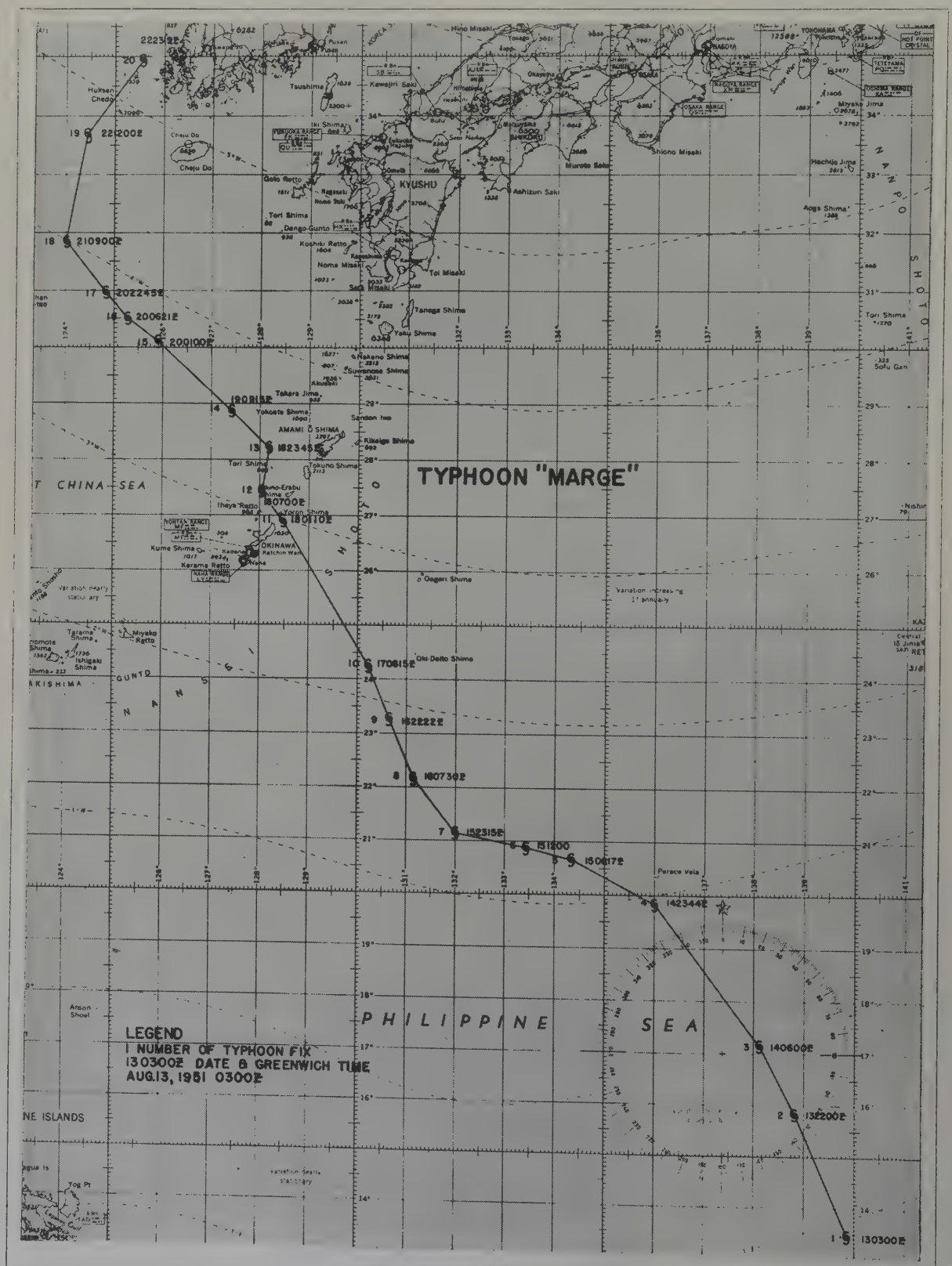
(*Continued on page 44*)

WADF VICE CMDR is Brig. Gen. Hugh A. Parker *(right)*. Officer with him is Col. Wise



Typhoon-Finders

Typhoon-Finders of the 56th are at home in a storm center to collect data to save lives, property



PATH of tropical cyclone "Marge" is shown on this chart. The typhoon was tracked by 56th Reconnaissance Squadron

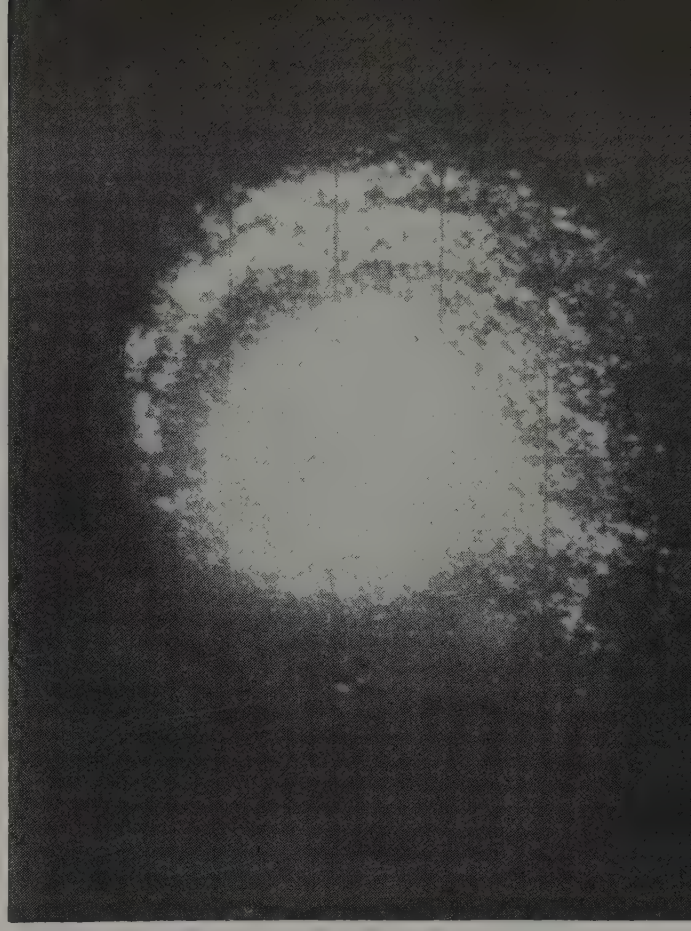
Flying directly into the center of a tropical typhoon aboard one of the Boeing WB-29 *Superforts* of the weather reconnaissance squadrons of the Air Weather Service is an awe-inspiring experience, weather crewmembers relate.

"The plane flies along in the soup—bouncing around like a rubber ball," weathermen report, "when suddenly the sun breaks through, the turbulence ceases, and the *Superfortress* plunges into the dead-calm eye of the storm."

Being in the eye of the typhoon is a welcome but short-lived lull, for the work of the "Typhoon Finders" of the 56th Strategic Reconnaissance Squadron, Medium, Weather, is just beginning. The storm threatens a tremendous amount of damage and possibly will take many lives before its force is spent. The mission of the WB-29 crew is to collect storm data from the center and surrounding areas of the typhoon. This data will prove valuable in forecasting the typhoon's movements and velocity to ships at sea and inhabited areas across which the storm may sweep. (*Continued on page 45*)

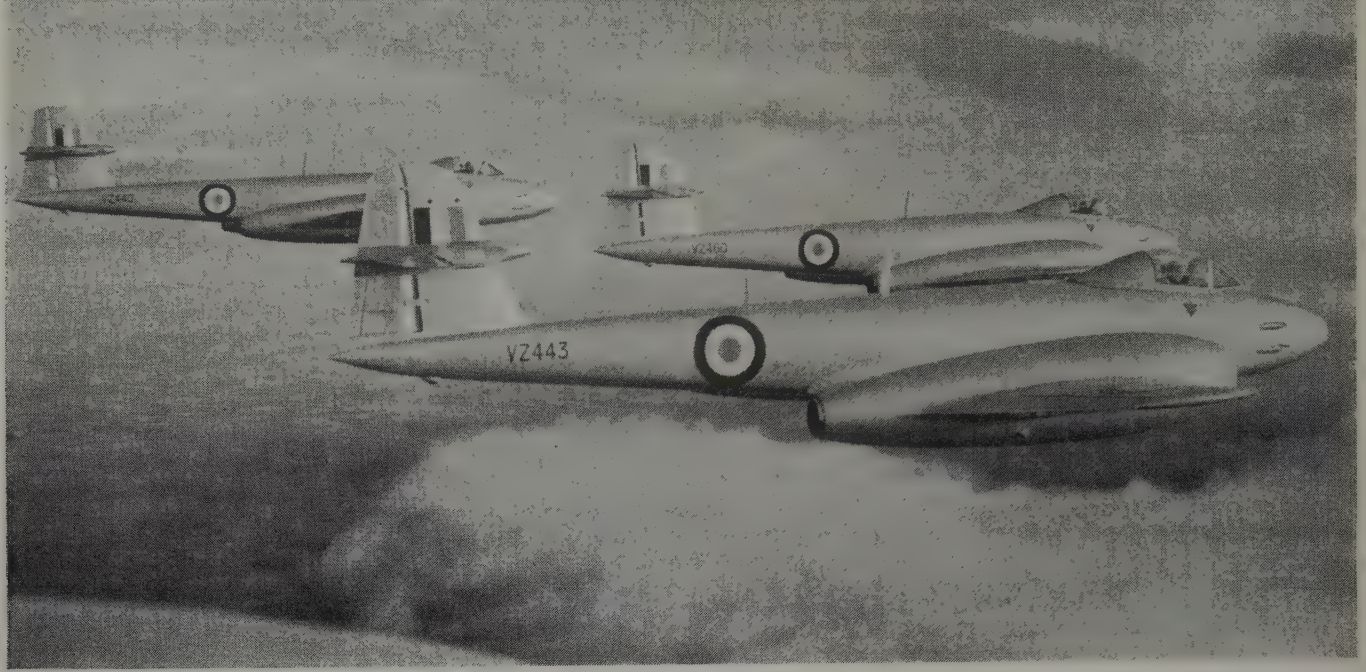
By Capt. Martin Krassner

56th Strategic Recon. Squad.,
Air Weather Service



EYE of the typhoon, as shown here, is filling. This means the storm is diminishing, will soon dissipate

AIR WEATHER SERVICE planes are Boeing *Superfortresses*. Typhoon "Marge" was tracked by crewmen in Air Force WB-29's



GLOSTER METEOR F.8 is latest production model. It differs from earlier Mk. 4 in having redesigned tail unit, lengthened fuselage, new cockpit enclosure, new wing root fillets. Result—a higher limiting Mach number

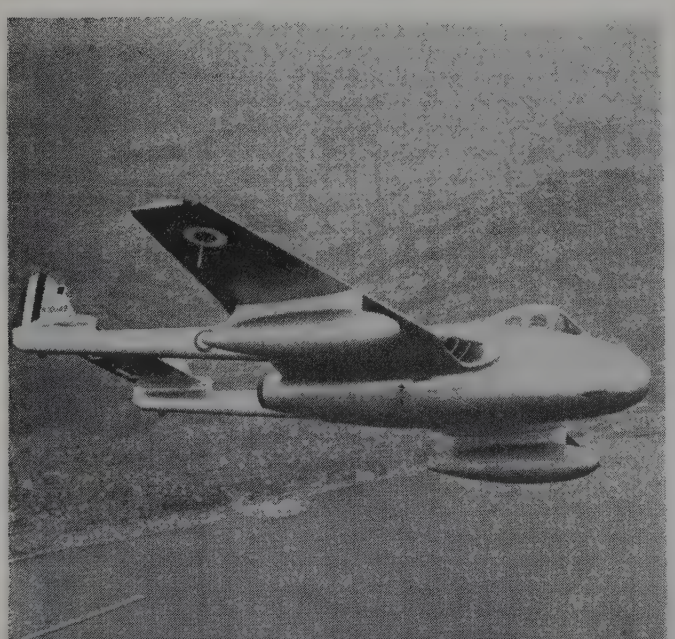
Special Section

JET FIGHTERS

An assessment of operational qualities of fighters serving W. Europe

By WILLIAM GREEN

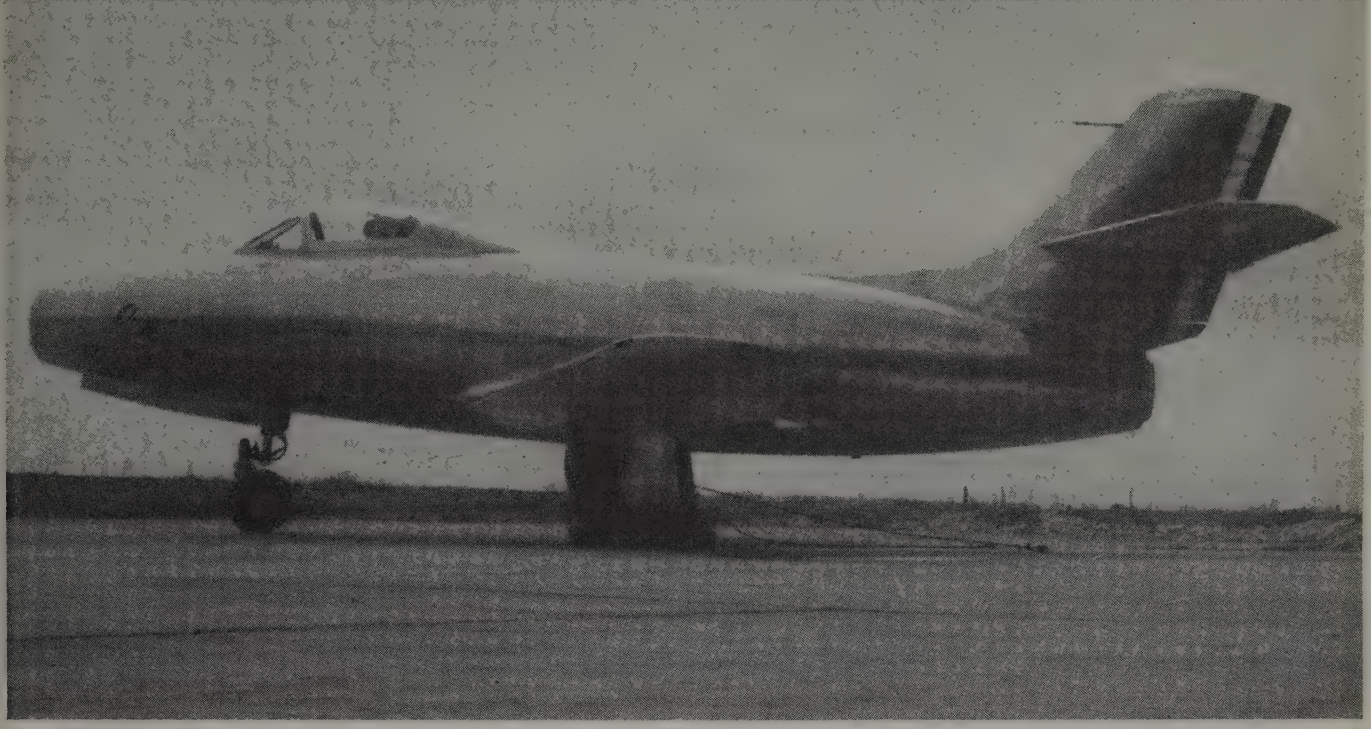
DE HAVILLAND VAMPIRE 5 production continues in Italy and in France. While considered capable of effectively intercepting piston-engined bombers, the *Vampire* is not believed capable of intercepting Soviet jet bombers



A THREEFOLD purpose underlies this study of Western Europe's jet fighters; to present a realistic picture of the limitations of the airplanes now available and those to be delivered in the foreseeable future; to assess the operational qualities of the machines now serving with West European fighter elements, and to indicate the channels of future development.

Some 18 months ago the difficulty was to make West European countries recognize the urgency of the need to rearm; no avowal of peaceful intentions could have been nearly so convincing as their obvious reluctance to do so. Fortunately, the Korean war and its early reverses taught the lesson which exhortations had failed to drive home. Now—at last a sense of urgency is being felt, production is gaining momentum and concrete progress in the building-up of combat strength is to be seen.

The chief tactical problem facing the countries of Western Europe can be stated very simply: to resist and contain any aggression. The only possible aggression must come from the Soviets and, thus, the planning task facing the West is clear cut. We know that the Soviet Union has upwards of 8,000 tactical combat airplanes pointing West, poised ready to annihilate any opposition in the path of Russian armored spearheads. Very clearly,



DASSAULT MD 450 is first French jet fighter of national design to enter service. Called *Ouragan*, it is an "all-round" fighter capable of both high- and low-level operation. It is powered by French-built Rolls-Royce *Nene*

FROM WESTERN EUROPE

major Western effort must be directed toward countering this threat of Soviet tactical air power and maintaining control of the skies.

A system for the integration of Western air arms can now be considered as established, but there remains the predominantly logistic problem of supplying West European combat elements with the latest types of military aircraft and the myriad of equipment without which such machines are useless. Progress towards the development and production of such airplanes is being made, but already maladjustments and shortages of materials threaten, and the problems of maintaining international stability in the economic sphere and simultaneously stepping-up rearmament programs are no longer academic but real and immediate.

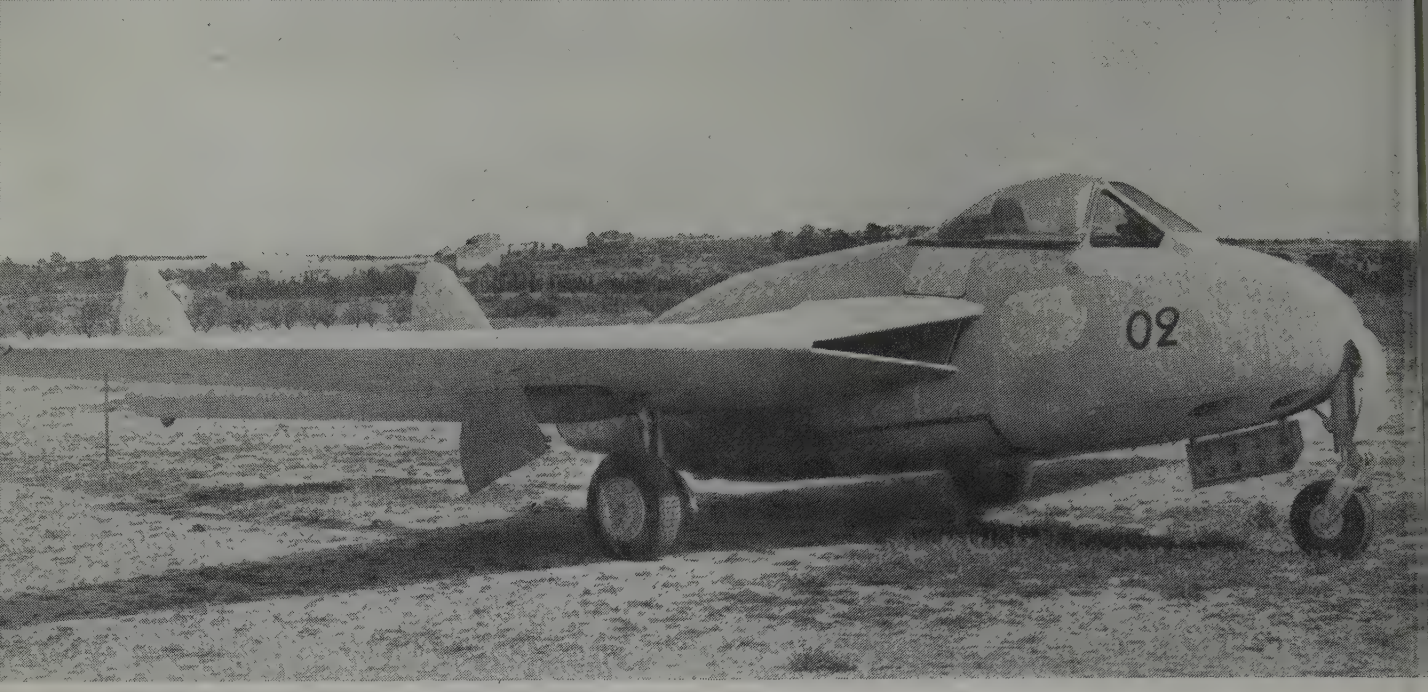
The confusion and lack of cooperation between the aircraft industries of the West European countries is now giving place to a coordinated development and production program which will result in a much brighter air defense picture in a few years time; whether the time necessary to complete this transformation will be vouchsafed is another matter.

Land-based Single-seat "All-round" Fighters

Bearing in mind the purpose and strength of the Soviet air arm, it can be seen that the primary need of western air defense is fighters. The fighter has one primary duty: to kill. Other duties come its way, according to the exigencies of the moment, but in essence the fighter is a killer first and last.

That, where known, the characteristics of potential

DE HAVILLAND VENOM is really a souped-up *Vampire*. It features a refined wing design and a 5,000-pound thrust *Ghost* engine in place of the 3100-pound thrust *Goblin*. Speed of the *Venom* (at sea level) is about 610 mph



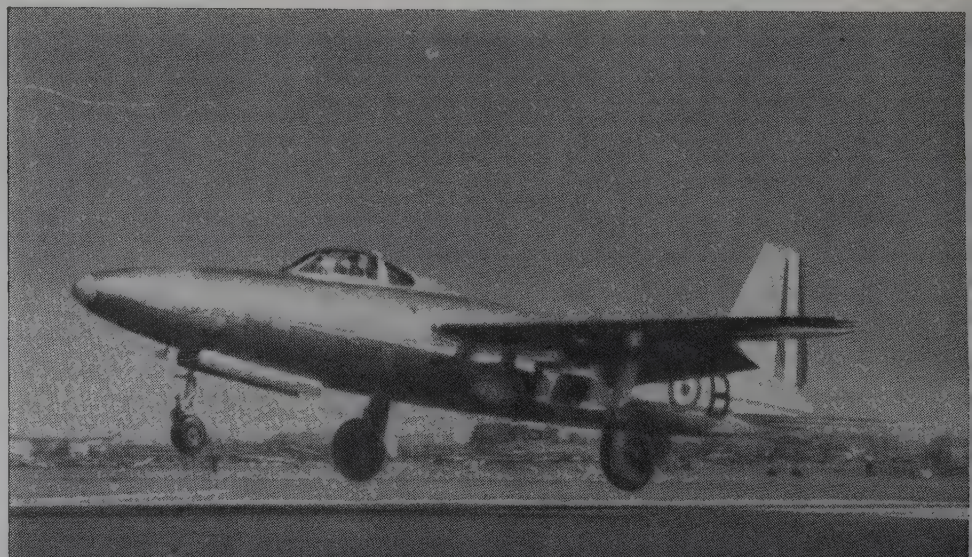
SUD-EST MISTRAL is French development of the *Vampire*. Sometimes referred to as the *Vampire* 53, it is powered by a *Nene* of 5,000 pounds thrust, instead of the British *Goblin* of 3100 pounds thrust; has speed of 578 mph

opposing airplanes and the circumstances under which these will be engaged must be deciding factors in fighter design is axiomatic, and the unpleasant surprise sprung by the quantity appearance of the MIG-15 acts as an outstanding illustration of the dangers of deficient or ineffectually exploited Intelligence. Lack of knowledge of Russian prowess is presumably one of the reasons for the present preponderance in Europe of "all-round" fighters to the exclusion of specialized interceptors capable of meeting the MIG-15 on terms of parity. That a higher degree of specialization must be accepted is now as obvious to the air forces of Western Europe as it is unpalatable.

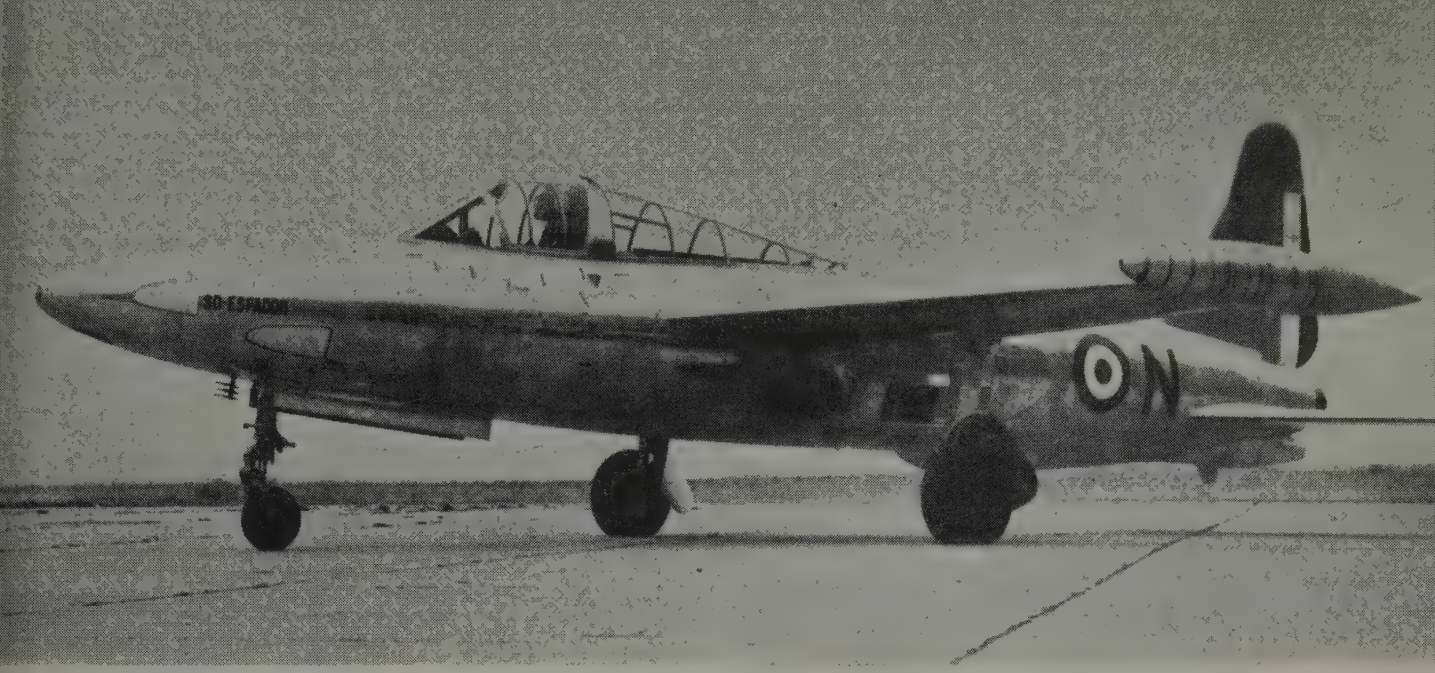
Deficiencies of funds and manpower have obliged West European air arms to depend on a dangerously small number of types; single-seaters manifesting varying degrees of compromise between the cardinal requirements of speed, climb, maneuverability, ceiling, acceleration, endurance and firepower. They are typified by the British-designed Gloster *Meteor* and de Havilland *Vampire* which, apart from a few F-84 *Thunderjets*, are the only jet fighters in quantity service in the European area.

While acknowledging the merits of the "all-round" fighter, it is wise to reflect that in the late war both the RAF and USAF were at times embarrassed by the lack of certain specialized interceptors. Inadequate technical Intelligence concerning Russian work and the inability to predict the course of possible campaigns is largely responsible for prolonging the life of the "all-round" fighter until today, and the fact that many airplane plants are now committed to the production of the *Meteor* and *Vampire* for at least another year indicates that the "all-round" fighter will survive in frontline service for some years to come.

These fighters are certainly suitable for the at-



SUD-OUEST ESPADON, designated So 6021, is third in the *Espadon* series (two So 6020's). It features a redesigned tail unit and smaller cockpit. Its new Leduc-Jacottet servo controls have been called better than comparable U. S. designs. There is doubt *Espadon* will be produced



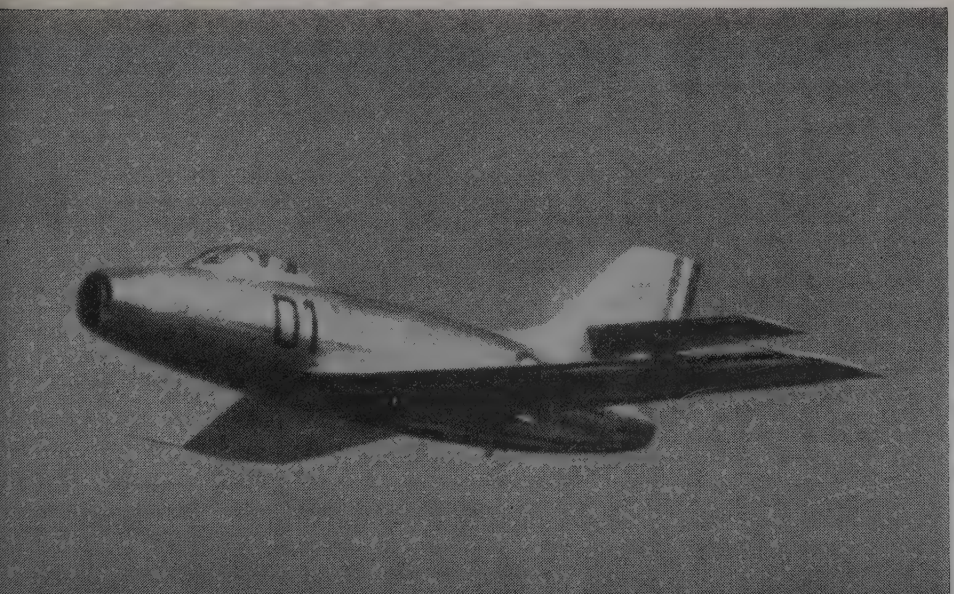
SUD-OUEST ESPADON is called "bomber destroyer." It features a sweptwing. This version (SO 6026) gets extra thrust from an R-251 bi-fuel rocket motor installed in the tail to boost its climb and speed at altitude

tack of ground targets as well as for the interceptor role; that they will be increasingly handicapped when matched with more specialized machines such as the MIG-15 is equally certain. Had the West been aware of the speed with which Russia was getting her modern combat jets into squadron service, design policy and advance production plans might have taken a different turn.

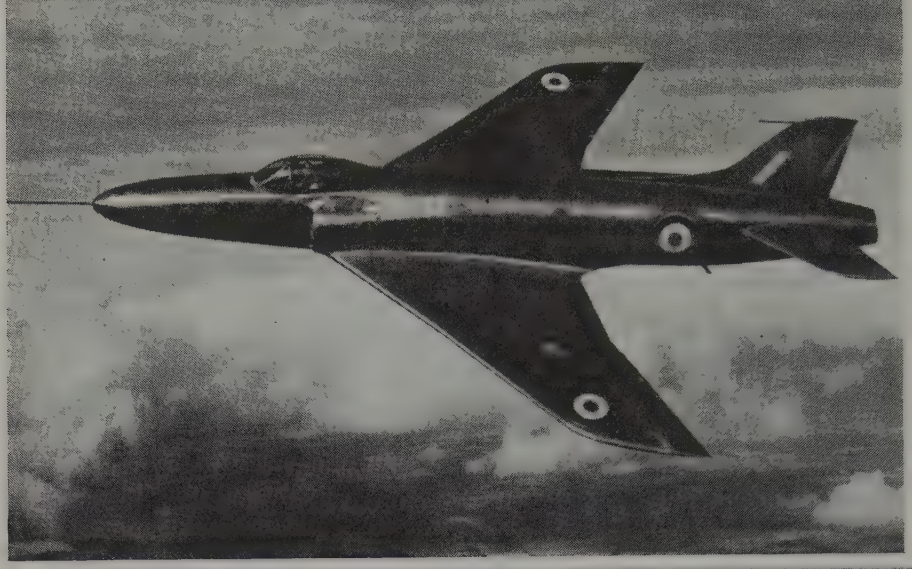
Doubts have been expressed concerning the advisability of continued production of the *Meteor* and *Vampire* in view of world progress since their basic designs were laid down. It is to be admitted that the remarkable tractability evinced by these machines some years ago hypnotized those responsible for the placing of orders into thinking that, by the time the potential enemy had anything to compare with the *Meteor* and *Vampire*, the West would have something more advanced in service. The behind-scenes furore in West military aviation circles, following on the news that the MIG-15 was in *quantity service* while a comparable West European machine had *yet to be ordered*, can well be imagined.

But, today, fighters are wanted quickly if combat strength is to be built up and, despite their shortcomings, the *Meteors* and *Vampires* are rolling off assembly belts in British, French, Dutch, Belgian and Italian plants, whereas the cancellation of present contracts and retooling for entirely new designs would be a process involving years; years in which the build-up of combat strength would be virtually at a standstill. While West European squadrons lack fighters in quantity, versatility in those that they do possess is of paramount importance.

The *Meteor* F. Mk. 8, the latest production variant of this single-seat fighter, has already received its combat initiation in Korea, where a number of machines have been used by the RAAF. Initial



DASSAULT MD 452 is called *Mystere* and is a development of the MD 450 *Ouragan*. Those who have flown the *Mystere* say its performance compares with that of the F-86. It has been flown at 687 mph in level flight. Present powerplant is the *Nene*, but it will be replaced by the *Tay*



SUPERMARINE SWIFT was ordered "off the drawing boards" for quantity production. It is powered by Rolls-Royce *Avon* turbojet unit rated at more than 7,000 pounds thrust. Reports indicate its armament will be four 30-mm guns

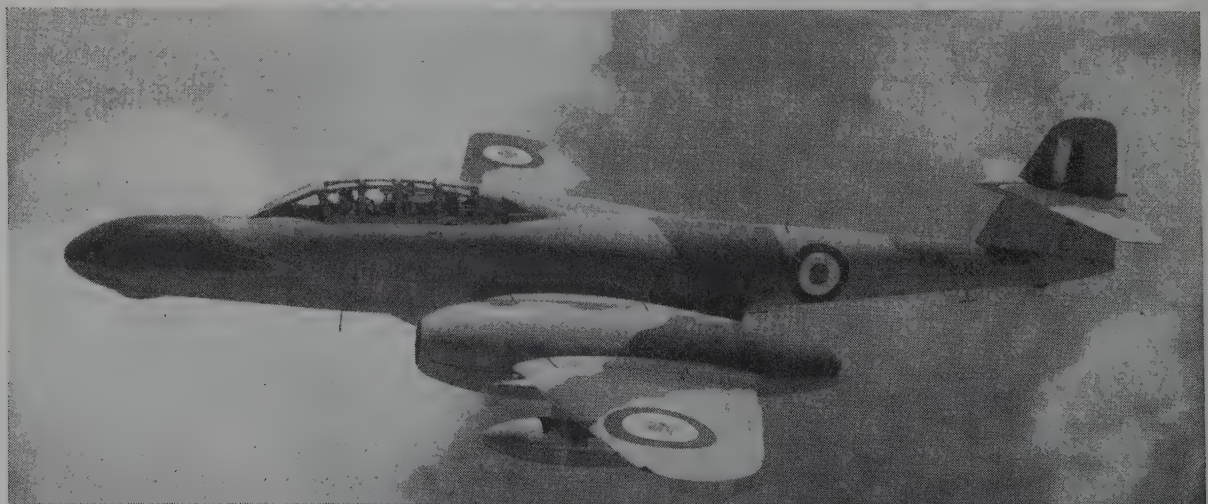
HAWKER P. 1067 is a lineal descendant of the *Hurricane*. It, like the *Swift*, was ordered into quantity production right from the drawing board. It, too, is powered by the more than 7,000 pounds thrust *Avon*. Plane may be named the *Hunter*

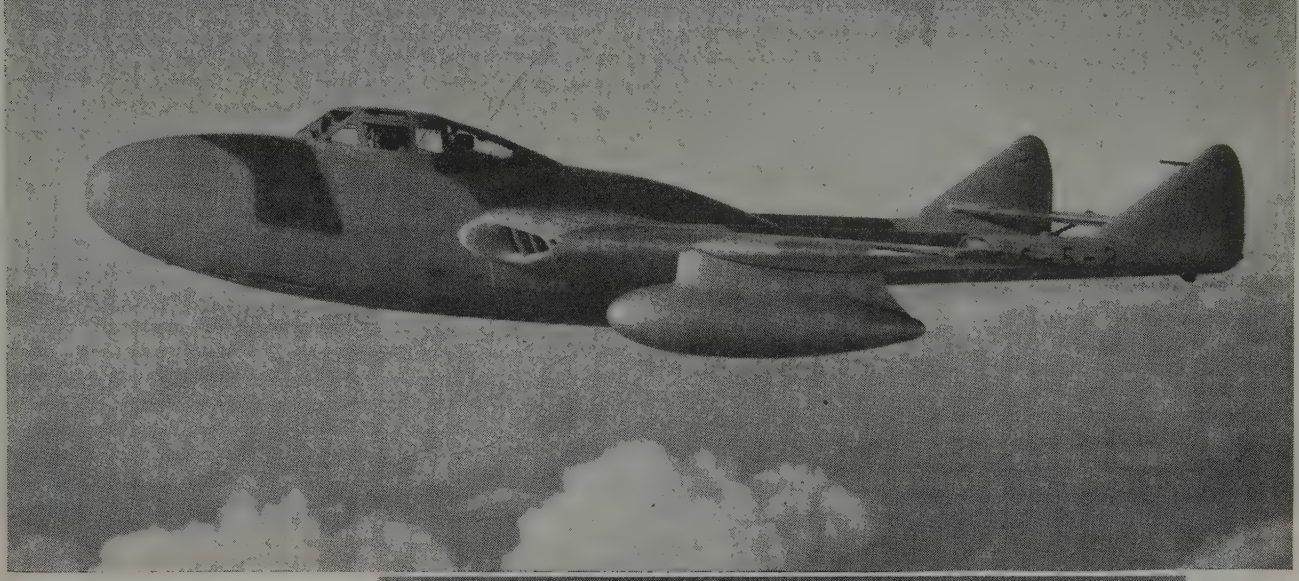
reports of the *Meteor's* showing against its faster antagonist, the MIG-15, are insufficient to judge the outcome of this baptism of fire. The *Meteor* 8 is distinguished from the earlier Mk. 4 in having a completely redesigned tail unit, lengthened fuselage, revised cockpit enclosure and new type wing root fillets, the net result being an increase in the limiting Mach number from 0.78 to 0.82.

The *Meteor* is serving with a considerable proportion of RAF fighter squadrons, the Dutch, Belgian and Danish air forces and, in addition to being built in Britain, is in production at the Schipel plant of the Dutch Fokker company, while Dutch-manufactured components are being assembled by Avions Fairey at Gosselies in Belgium.

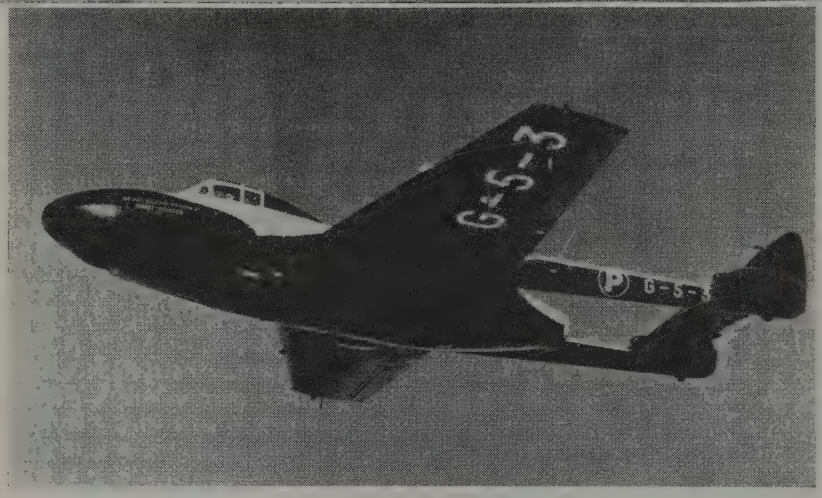
Sharing with the *Meteor* the task of West European fighter defense is the *Vampire*, production of which is being tapered-off in Britain but continues

METEOR N.F. 11 is a night fighter version of the Gloster *Meteor* F.8. It is built by Armstrong Whitworth Aircraft and is already in service with the RAF and Belgian squadrons. Its crew of two sit side-by-side





DE HAVILLAND N. F. 10 is the night and all-weather version of the single-seater *Vampire*. The N. F. 10's crew of two, pilot and radar observer, sit side-by-side. Cockpit layout follows war-proved plan of the *Mosquito*

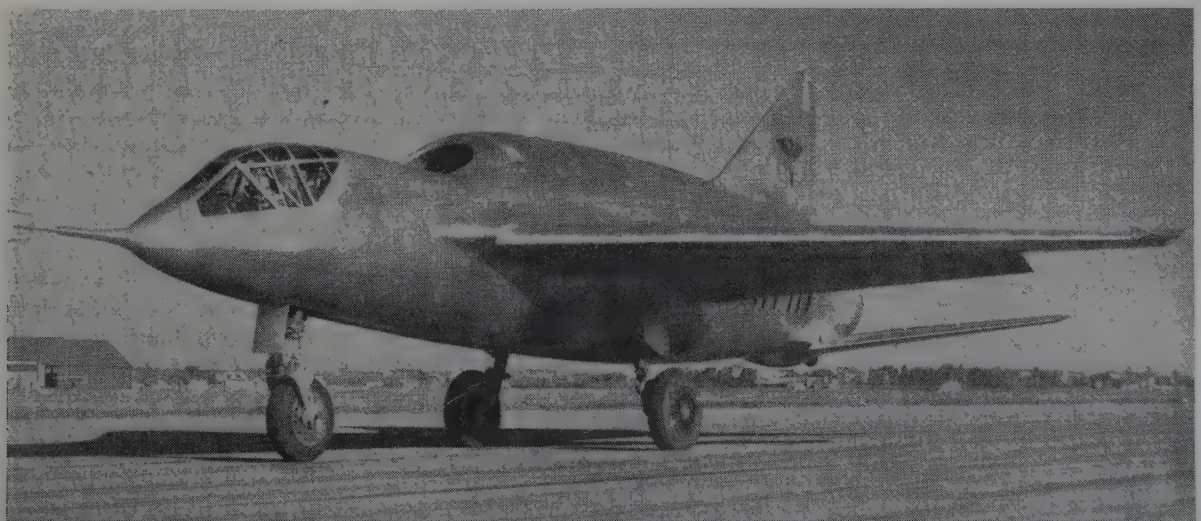


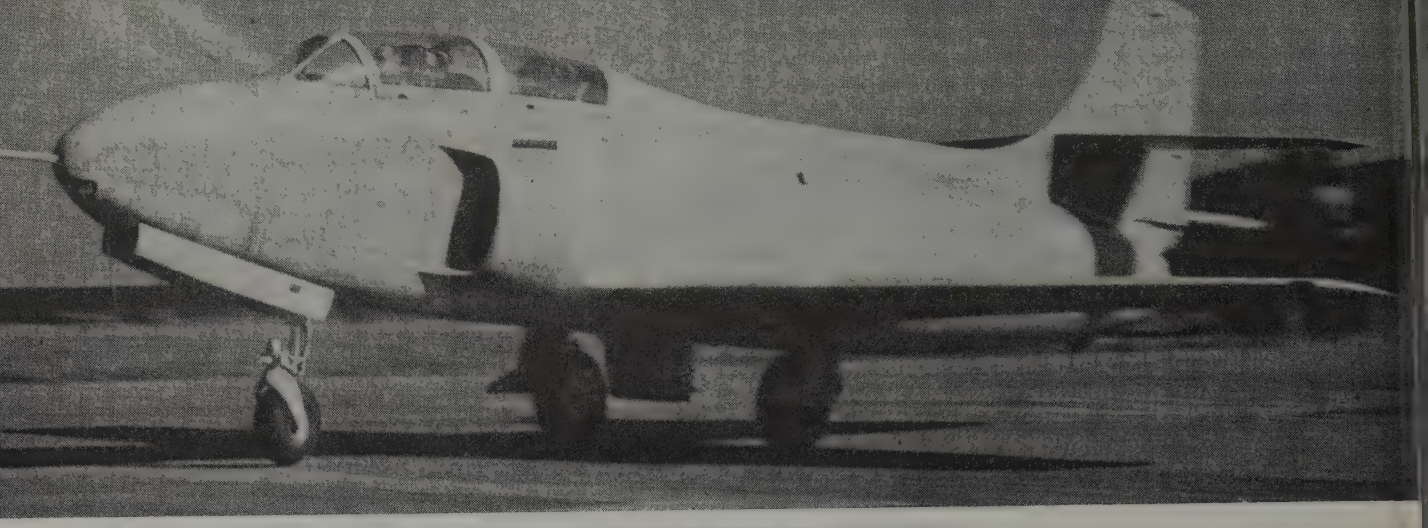
DE HAVILLAND N.F. 2 is the night-fighter version of the *Venom*. It is to be built in France by Sud-Est. The N.F. 2 carries its radar in its lengthened nose. The *Venom's* crew of two sit side-by-side, also following *Mosquito* plan

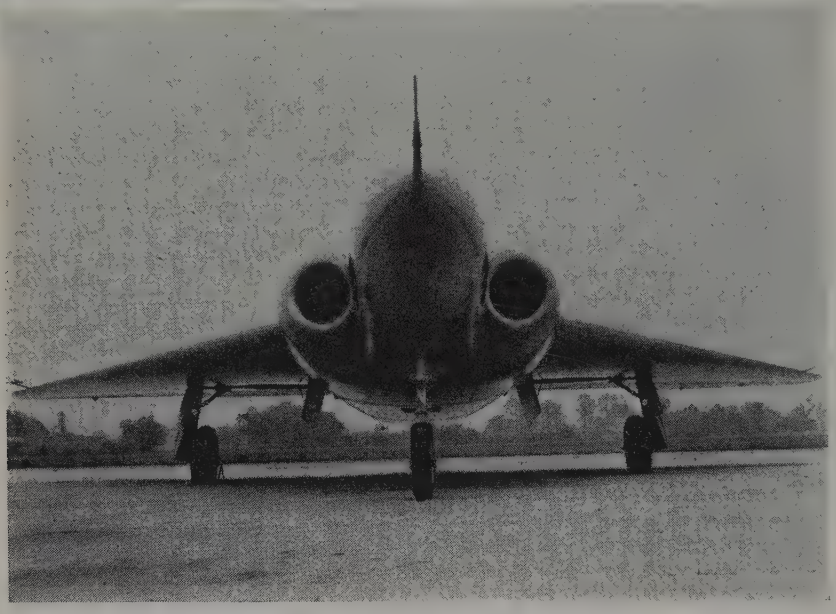
in Italy, at the Fiat, Macchi and SAI-Ambrosini plants, and in France by the S. N. C. A. du Sud-Est at Marignane, near Marseilles. Like the *Meteor*, top speed of the *Vampire* is unspectacular (*see chart, page 26*), but the essential qualities of the *Vampire* stem from its moderate weight, size, wing and span loadings; its consequent short take-off, exceptional docility and maneuverability, and unequalled control ability at great altitudes.

The high maneuverability of both the *Meteor* and the *Vampire* at altitude means that accurate interception of high-flying bombers is not nullified by the inability to administer the *coup de grace*, but a fighter *must* possess a high maximum speed in order to overhaul a jet bomber such as the Russians will possess in numbers in the not-too-distant future, or otherwise to position itself advantageously for attack. While the *Meteor* and *Vampire* are unques-

SUD-EST SE 2410 is known as the *Grognard*. This prototype and the SE 2415 are powered by two Hispano-built *Nenes* staggered one above the other in the fuselage. The third prototype of this night fighter is the SE 2421







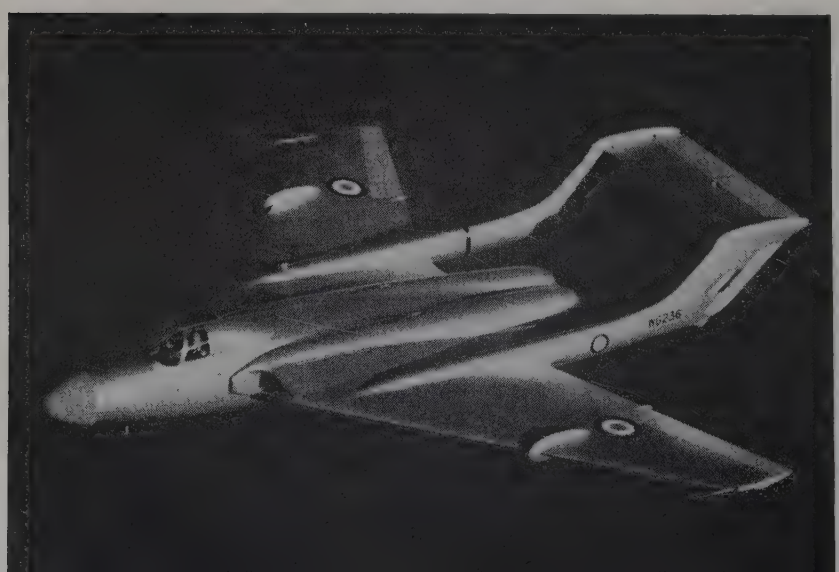
FIAT G. 20 is Italy's first postwar nationally designed jet airplane. While this model is jet trainer, an all-weather version is in the works. Trainer is powered by *Goblin* 35; the all-weather version will have a *Nene* or *Ghost* unit

GLOSTER G.A. 5 is a twin-jet delta wing all-weather fighter powered by two J-65 *Sapphires* of 7,000 to 8,000 pounds thrust. This fighter is still undergoing competitive trials with the De Havilland 110; may be named *Spearhead* G.A. 5

tionably capable of effectively intercepting formations of piston-engined bombers, it is doubtful if they could intercept and destroy high-flying high-speed Soviet bombers such as the twin-jet Ilyushin described in the December issue of SKYWAYS.

The only fighters that are likely to join the *Meteor* and *Vampire* in West European squadrons during the next three years or so are the Dassault MD 450 *Ouragan* (*Hurricane*), and the British de Havilland *Venom* F. 1. These are, like their predecessors, "all-round" fighters, amenable to both high- and low-level operation and offering some performance improvements but no really notable advances.

The Dassault *Ouragan*, which will be the first French jet fighter of national design to enter service, appeared over four years ago, at which time it was well abreast of world standards. But the *Ouragan* has been one of the chief sufferers



DE HAVILLAND D.H. 110 is both a day and night fighter. If chosen for production, it will be known as *Vixen*. It is powered by two Rolls-Royce *Avons* of more than 7,000 pounds thrust each. Plane's crew of two sit side-by-side

ARSENAL VG 90 is a prototype naval fighter undergoing tests in France. It is powered by a *Nene* jet engine, and features a "shoulder position" swept-wing. Armament consists of three 30-mm guns. It is a single-seater jet

NORD 2200 is a French naval fighter, also in the prototype stages. It too is powered by a *Nene* and carries armament similar to the VG 90. French Navy being committed to *Venom*, there is some doubt about Nord 2200 production plans

of the procrastination and dabbling in combat-airplane development that has gone on in France since the end of World War II. Although in production at last, only a few hand-built *Ouragans* have flown and the machine is already out-dated. Intended to replace the *Vampire* with French fighter elements, the *Ouragan* is powered by a French-built Rolls-Royce *Nene* turbojet, and two months after its initial flight the prototype clocked 613 mph in level flight at 47,000 feet at the Bretigny Test Center. It also climbed to 29,520 feet in 6 minutes 21 seconds, and to 39,360 feet in 12 minutes. Flight demonstrations of this airplane witnessed by the writer left an impression of extreme maneuverability. An experimental version of the *Ouragan* has been fitted with a French ATAR 101C axial-flow turbojet, but production machines are likely to standardize on the *Nene* which gives adequate thrust

SUPERMARINE F.1 is a Royal Navy fighter called *Attacker*. It is a single-seater powered by a *Nene* engine and has a top speed of 590 mph. The *Attacker* is in squadron service and operating off the deck of the carrier, *HMS Eagle*

LEADING DETAILS OF WESTERN EUROPE'S JET FIGHTERS

Name	Engine	Total Maximum Thrust (Pounds)	Airframe Limiting Mach. No.	Sea Level Top Speed (mph)	Initial Climb Rate (ft/min)	Dimensions Span (feet)	Dimensions Length (feet)	Wing Area (ft)	Aspect Ratio	Leading Edge Sweep	Weights Empty (Pounds)	Weights Loaded (Pounds)	Built-in Armament	Status
Single-Seat Fighters														
De Havilland Vampire 5	Goblin 2	3,000–3,100	0.78	531	4,050	38′0″	30′9″	262	6.2	—	7,134	10,470	Four 20-mm	In Service
Gloster Meteor 4	Two Derwent 5	7,000	0.78	585	7,350	37′2″	43′6″	350	3.9	—	10,050	15,175	Four 20-mm	In Service
Gloster Meteor 8	Two Derwent 8	7,000–7,200	0.82	592	7,500*	37′2″	43′6″	350	3.9	—	10,626	15,675	Four 20-mm	In Production
Dassault Ouragan	Nene 101	5,000–5,100	0.84*	605	7,800	38′7″	34′9″	269	6.0	—	7,246	11,684	Four 20-mm	In Production
S.N.C.A.S.E. Mistral	Nene 101	5,000–5,100	0.78	578	6,000*	38′8″	30′9″	270	6.2	—	7,400	10,910	Four 20-mm	In Service
De Havilland Venom 1	Ghost 50	5,000–5,100	0.9*	610*	7,000*	41′9″	31′5″	279.8	—	—	—	—	Four 20-mm	In Service
S.N.C.A.S.O. 6021 Espadon	Nene 101	5,000–5,100	0.95*	625	5,000*	34′9″	49′2″	291	—	35°	10,450	15,116	Four 30-mm	Experimental
Dassault Mystere	Nene 101	5,000–5,100	0.98*	680	7,500*	36′*	35′6″	270*	—	35°*	7,500	12,000	Four 20-mm	1st Prototype
Supermarine Swift	Avon	7,000–7,500*	1.2*	700 plus	——	32′0″	42′11″	295*	—	35°*	—	—	Four 30-mm*	Production
Hawker P. 1067	Avon	7,000–7,500*	1.2*	700 plus	——	33′6″	45′0″	350*	—	40°*	—	—	Four 30-mm*	Production
Multi-Seat All-Weather Fighters														
S.N.C.A.S.E. 2421 Grognard	Two Nene 101	10,000–10,200	0.9	596	——	50′7″	54′9″	469	—	32°	—	36,116	——	Experimental
Gloster Meteor 11	Two Derwent 8	7,000–7,200	0.82	590	7,000*	43′0″	48′6″	350	3.9	—	11,700*	17,000*	Four 20-mm	In Service
De Havilland Vampire 10	Goblin 4	3,500–3,550	0.78	540*	4,000*	38′0″	34′7″	262	6.2	—	7,800*	11,400*	Four 20-mm	In Production
De Havilland Venom 2	Ghost	5,000–5,100	0.9*	605*	6,500*	41′9″	34′7″	279.8	—	—	—	—	Four 20-mm	In Production
Fiat G.80/1	Goblin 35	3,500–3,550	0.85	547	——	36′0″	40′6″	270	4.85	—	8,950	11,910	——	1st Prototype
De Havilland 110	Two Avon	14,000–15,000*	1.4*	—	—	—	—	—	—	40°*	—	—	Four 30-mm	Experimental
Gloster G. A. 5	Two Sapphire	14,000–16,000*	1.4*	—	—	—	—	—	—	—	—	—	Four 30-mm	Experimental
Naval Single-Seat Fighters														
Supermarine Attacker	Nene 3	5,000–5,100	0.825*	590	6,350	36′11″	37′6″	226	6.1	—	—	11,500	Four 20-mm	In Service
Hawker Sea Hawk	Nene 4	5,000–5,100	0.86*	610*	——	39′0″	39′7″	278	5.5	—	—	14,300	Four 20-mm	In Service
Arsenal VG 90	Nene 101	5,000–5,100	0.85*	562	4,530	40′11″	42′2″	330	—	25°	11,220	17,600	Three 20-mm	Experimental
S.N.C.A.N. 2200	Nene 101	5,000–5,100	0.82	593	4,724	39′0″	44′0″	340	4.56	24°	10,638	17,378	Three 20-mm	Experimental
Supermarine 508	Two Avon	14,000–15,000*	1.1*	—	—	—	—	—	—	—	—	—	Four 20-mm	Experimental

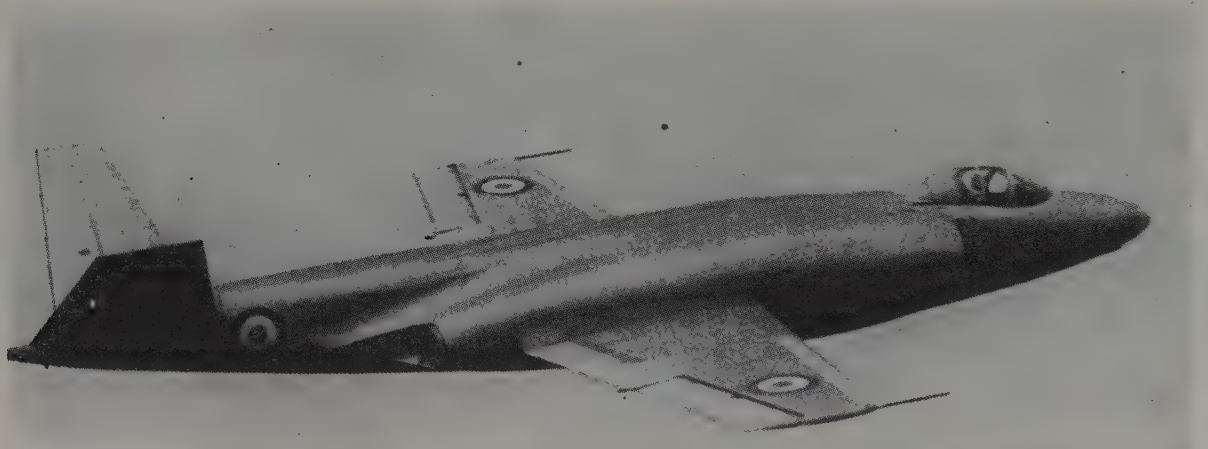
*Estimated figures

HAWKER F.1 is Royal Navy fighter called *Sea Hawk*. It is powered by a *Nene* and has top speed of 610 mph. With exhaust ducts in wings, F.1 carries its fuel in rear fuselage and has an extended range

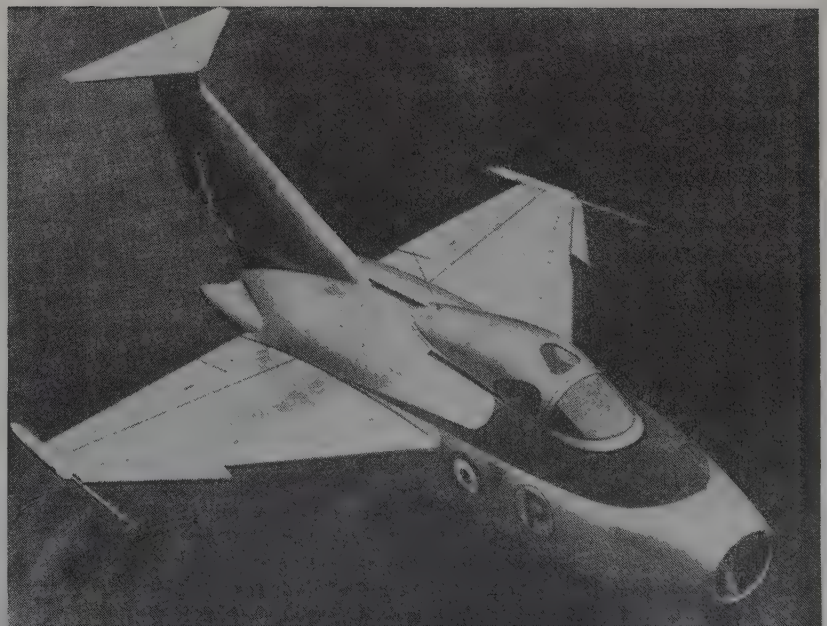
for speeds within the limitations of the airframe.

The basic design of the *Vampire* has proved to be capable of considerable development, and it was largely the knowledge that a much improved version would shortly be available that prompted the French and Italian governments to choose this fighter for domestic production. The souped-up *Vampire* is known as the *Venom* and features a refined wing design and a 5,000-pound thrust *Ghost* engine in place of the 3100-pound thrust *Goblin* 2. Speed has been raised from 531 mph at sea level to something like 610 mph, while the airframe Mach number limitation has jumped from 0.78 to around 0.9. While the speed, climb rate and service ceiling show marked improvement, the *Vampire's* docility and maneuverability have been retained in the *Venom*.

Being basically similar to the *Vampire*, the *Venom* can be placed on existing production lines without the elaborate retooling and extensive development which inevitably delay the introduction of a new type. Accordingly, the French and Italian plants now building the (*Continued on page 38*)

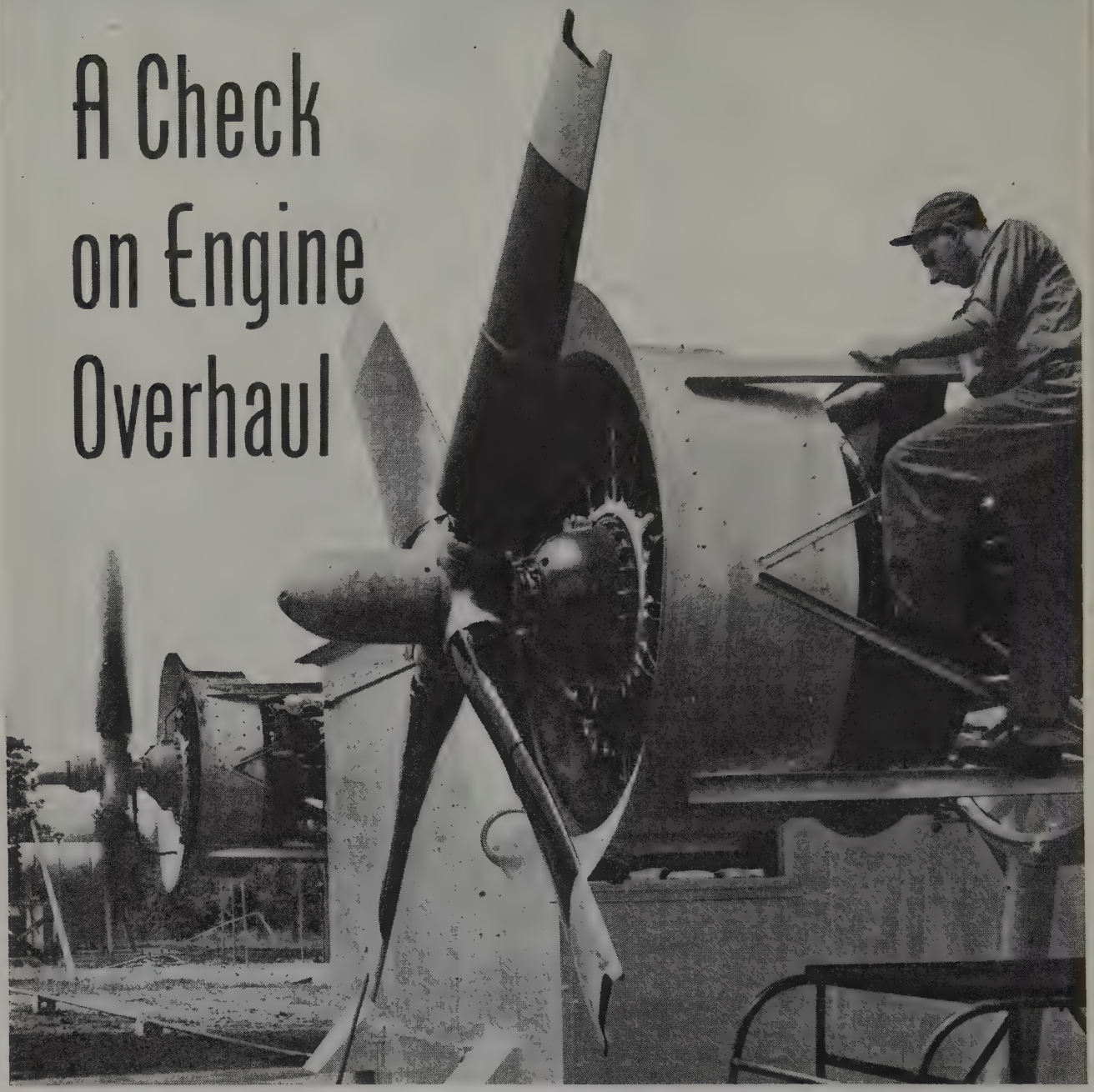


SUPERMARINE 508 is twin-jet naval fighter powered by two *Avons*. Feature of 508 is its butterfly tail, not heretofore seen on high-speed combat aircraft. Production version may have a sweptback wing



FAIREY F. D. 1 is a jet research airplane. Having a span of only 19 feet 6 inches, the F.D. 1 is the smallest British jet to have flown. First model is powered by a Derwent jet unit of 3500 pounds thrust; has wingtip slots

A Check on Engine Overhaul



OVERHAULED ENGINES get a test run in one of Airwork's five test cells that cover range from 205 hp to 2400 hp

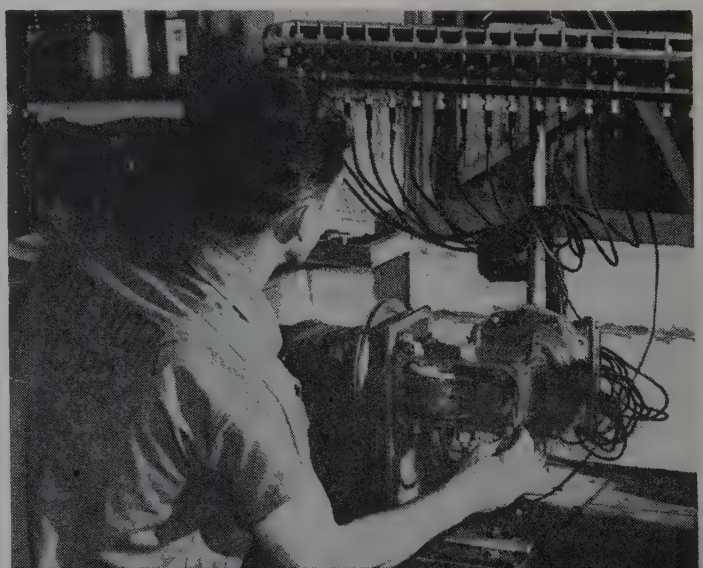
Here are a few engine facts to help insure perfect operation of powerplants

By DAVID DOWS

Airwork Corporation

A CHARTER operator in Pennsylvania has piled up over 60 million passenger miles since World War II, an oil executive in Texas has just ridden his 3,000th hour in his Twin-Beech and the scheduled airlines are running up new records every day. All have much in common—their de-

TECHNICIAN puts a magneto through its insulation breakdown test and check run. Final adjustments are made here



pendence on their airplane powerplants. For some strange reason there is an aura of mystery surrounding most references to aircraft engines; they're misunderstood, and often abused beyond reason. Aircraft engines are very much like humans—some of them run rough, some operate smoothly all day long, others are erratic and lots of them drink too much (oil that is!). One thing is for sure, though, aircraft engines are more predictable than humans and they are not inclined to failings, other than those of the people who run and maintain them.

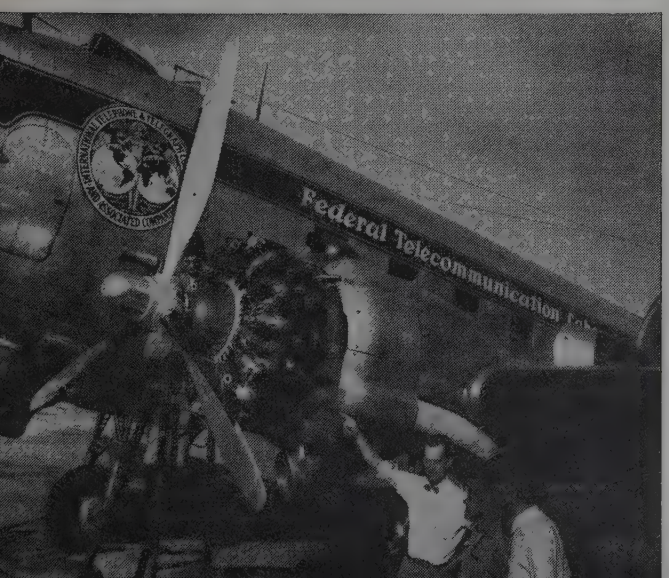
Many executive aircraft owners are completely non-plussed about their aircraft engines, and that goes for lots of pilots, too. In their course of aircraft operation they seem to live in eternal fear of the "engine failure." If that's your outlook, you can rest easy because engines don't just *stop;* they generally give all kinds of warning—easy to recognize if you are alerted to them.

How do you manage your engine's affairs? It's not too difficult. Let us assume that the power in your plane is new or has been freshly overhauled by an accredited overhaul base. That's the first good point—remember that just because the overhaul shop is large and has a CAA permit to be in business doesn't mean their work is up to the standards of safe executive-aircraft operation. Conversely, there are many small shops that do satisfactory work. The volume of engines going through the overhaul operation is a pretty good indication, because it means that the parts going into the work are turning over rapidly—out of inventory into service—and that's one of the real secrets of good engine operation. There is nothing worse for an engine part than to sit around on a shelf without proper preservation. Another reason why a volume shop is a good bet is that their employees are more experienced. The shop can train specialists, and it can keep up with the latest manufacturer and CAA modifications, thus protecting the operator from obsolescence. It can schedule an even flow of work through its shop, assuring an "on time delivery." There aren't a lot of acceptable engine overhaul shops in the U. S. Pratt and Whitney Aircraft, for example, has only four factory-approved Distributors and overhaul bases other than their own Airports Department at Hartford, Conn. Of these four there is only one that is exclusively in the Engine and Accessory overhaul business—Airwork Corporation in Millville, New Jersey.

The aircraft operator has an important job during the first 100 hours of engine operation. He must learn a great deal about his engine . . . he must have a memory like an elephant because the operation during this period is established as the "norm" and any subsequent variation from this will be an indication of impending trouble. If the danger signs are disregarded, there may be sudden stoppage of the engine at an inopportune moment! Watch your fuel and oil consumption during this first 100 hours. The oil consumption will start high and slowly decrease as the engine parts wear to each other. It will then level off to a constant rate which will slowly increase as the time builds up on the engine. *If there is any sudden change in this consumption, take immediate action.* Obviously, as the time builds up on the engine so will the oil consumption and eventually it will reach the maximum recommended by the manufacturer. This is generally believed to be double the original consumption after it has stabilized. When this happens, an engine overhaul is indicated.

It is time for your first check when those first 100 hours are up. This should be done in the shop of a qualified fixed-base operation. In some cases, companies have their own co-pilot/mechanic who does these checks. But here is a point of paramount importance—engines were made to fly *not* to maintain! If it's running okay, leave it alone—tinkering with engines doesn't help anything. A regular 100-hour check—yes! (*Continued on page 52*)

CREW of the Federal Telecommunication Laboratory plane watch an Airwork mechanic install plane's spare engine



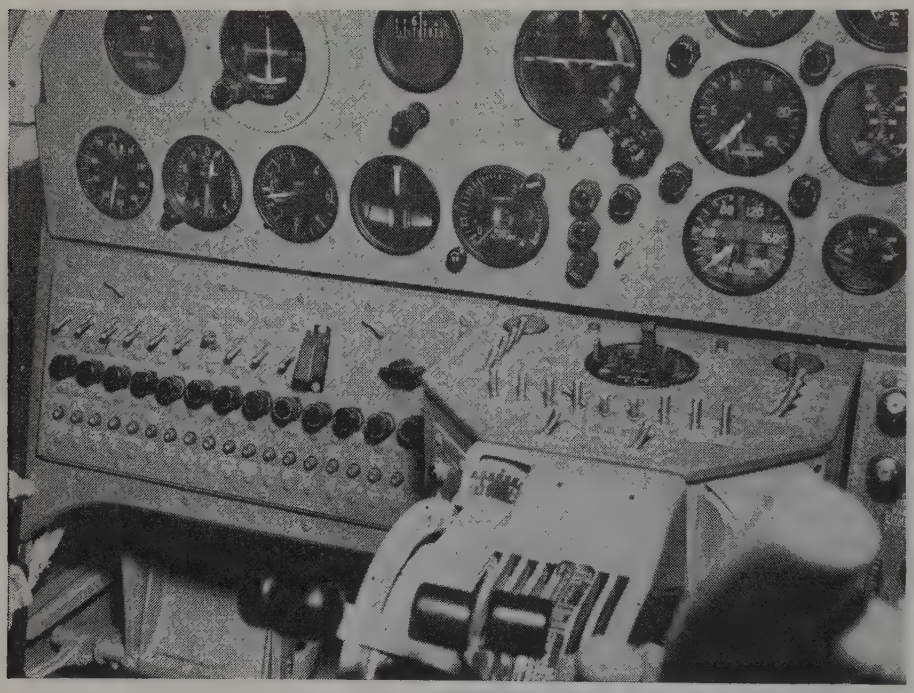
CORPORATION-PLANE owners have spare engines in storage, preserved and ready for installation when they're needed

Executive Conversion: B-25

SAC-DESIGNED instrument panel features fold-down arrangement permitting easy access to instrument connections

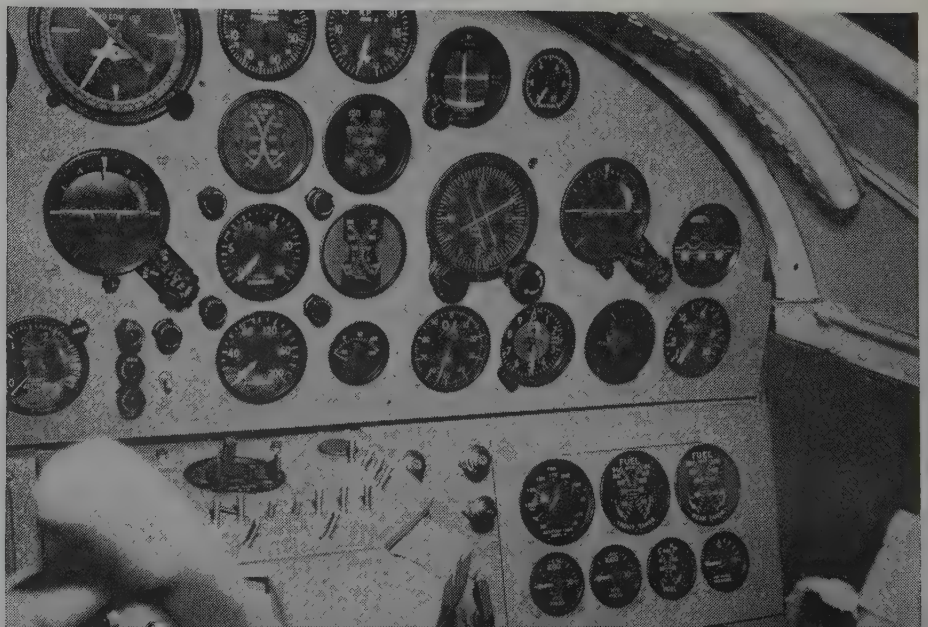
It's a far cry from the grim, utilitarian *Billy Mitchells* of the Doolittle vs Tokyo raid to the sleekly luxurious executive B-25 operated by Albert Trostel & Sons Co., Milwaukee, Wis., and converted by Southwest Airmotive Company, Love Field, Dallas. Where the gunners once stood are mahogany-framed and curtained windows and the bomb bays, built to carry missiles of death, now carry nothing more deadly than suitcases filled with sox and underwear.

The Trostel company had been operating this B-25 for executive purposes for several years, and SAC's assignment was in the nature of a complete renewal and rebuilding of the interior and of much of the components. Included, besides the interior, was an instrument panel, 1,000-hour check, replacing of one engine, overhauling of the props, addition of eight new windows (there are now a total of 14 in the cabin, two in the lavatory, plus those in the cockpit), and



WARNING LIGHTS and electric switches formerly were scattered about the cockpit. In rebuilding, they were brought together for better operation in an electrical sub-panel located beneath the main panel on pilot's side

FUEL GAGES and hydraulic gages were moved to a sub-panel *(right)* located beneath the main one on co-pilot's side. To permit installation of this shock-mounted sub-panel, the B-25's vent controls were moved to its left

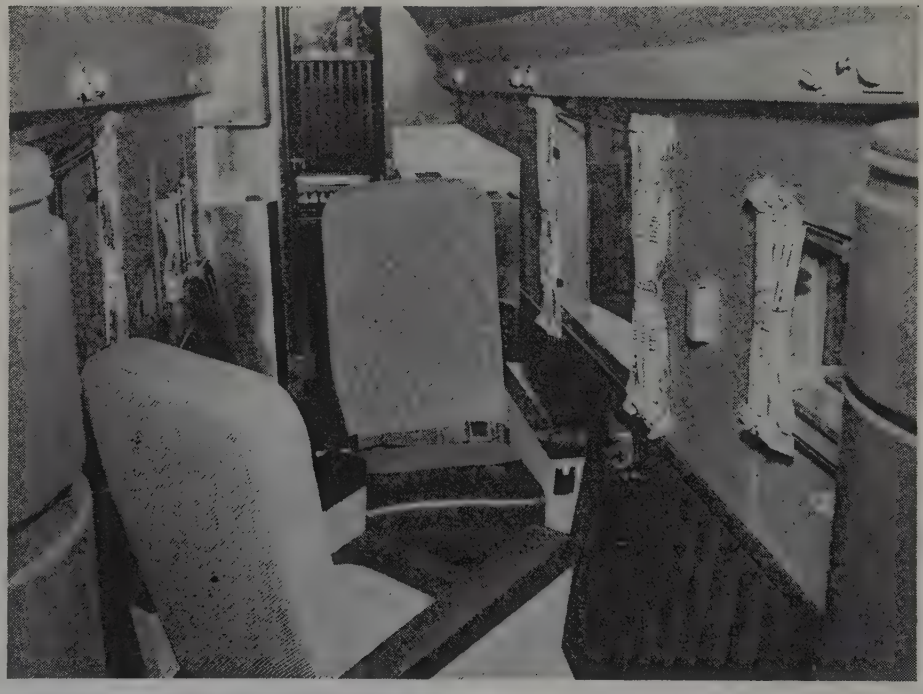


painting of the aircraft a bronze-brown with red and white striping.

Many of the improvements went into SAC's design, fabrication, and installation of the plane's instrument panel, with the company's shop personnel working closely with Pilot Tommy Neyland. Formerly, to remove an instrument for repairs it was necessary for the serviceman to get in the plane's nose and then to take out part of the heating system to gain access to the panel's backside. This took from two to four hours labor. The new SAC-built panel has a "piano hinge" across its bottom and, with the removal of six screws across its top, it can be folded down forward in about 30 minutes, readily exposing instrument cases and connections. The entire panel can be removed from the airplane in about two hours. To make the fold-down possible, propeller feathering switches were countersunk in the small pedestal panel just forward of the throttles, and they can be quickly unlocked electrically by punching separate buttons. SAC added a new C-1 Sperry gyrosyn compass and an extra gyro, and made provision in the panel for the future addition of such other equipment as may be desired by the pilot. Two DC-6 pitot heads were placed in the nose of the plane, instead of in the wing as they formerly were, and this move has reduced linkage by 30 feet. It permits a better de-icer boot fit, reduces vibration, and enhances the over-all appearance. A unique and especial-

(*Continued on page 52*)

GENERATOR control panel, switches and circuit breakers are now located within easy reach behind co-pilot's seat



MAIN CABIN *(above)* of the B-25 is located aft of the crawlway. This view, looking to rear of plane, shows two full-swivel chairs. Not shown in this photo is custom-built double seat. Compartment in back is the lavatory

CRAWLWAY features leather storage bins built into corners. Crawlway separates aft or main cabin from front cabin. This view is looking toward the cockpit from the main cabin. Floor of crawlway is covered by foam rubber

GENERAL MOTORS fleet of business aircraft includes Buick Motors Car's Lockheed *Lodestar*, shown here taking on exec passengers at the Executive Plane gate at LaGuardia

SKYWAYS for BUSINESS

News notes for pilots and owners of the 8,000-plus airplanes for business

Piper Questionnaire Shows Trend to Business Flying

The results of a questionnaire sent out by Piper Aircraft to all purchasers of 1951 Piper airplanes indicated definite trends toward higher utility in present day business aircraft. Among the findings announced are:

1. *Increasing use of planes for business:* 80 per cent of the Piper *Pacer* owners reported they use their planes at least half of the time or more for business purposes. About 63 per cent of the *Tri-Pacer* owners reported they use their planes for business 50 per cent of the time.
2. *Omni receivers increasingly popular:* 17 per cent of the *Tri-Pacers* and 25 per cent of the *Pacers* are omni-equipped, in line with the increasing use and installation of new radio aids for navigation. All of the *Pacers* are equipped with some kind of radio; and 92.5 per cent of the *Tri-Pacers*.
3. *Increasing trend toward instrumentation:* 54 per cent of the *Tri-Pacers* and 45 per cent of the *Pacers* are equipped with the primary flight group or better, with a rapidly increasing number of gyro instruments reported.
4. *Increased ratio of sales to businessmen and farmers over operators:* About 80 per cent of the aircraft built for non-military use by Piper in 1951 went to business firms, private individuals and farmers, with the balance of 20 per cent going to airport service operators and dealers. This four-to-one ratio indicates a decided trend toward the sale of aircraft for non-aeronautical revenue-producing purposes.

A breakdown of the number 1 finding *(increasing use of planes for business)* showed that 17 per cent of the *Tri-Pacer* owners and 21 per cent of the *Pacer* owners use their aircraft solely for business; 17 per cent and 18 per cent use their planes 90 per cent for business; 15 per cent and 26 per cent use their *Tri-Pacers* and *Pacers* for business 75 per cent of the time.

A break-down of the number 2 finding *(radio equipment)* indicated that 17 per cent of the *Tri-Pacers* and 25 per cent of the *Pacers* are equipped with omni; 8.5 per cent of the *Tri-Pacers* and 2 per cent of the *Pacers* carry ADF; 69 per cent *(Tri-Pacer)* and 51 per cent *(Pacer)* are equipped with both VHF and LF, whereas only 4 per cent of the *Tri-Pacers* and 2 per cent of the *Pacers* carry VHF only.

Draft Boards Authorized to Defer Agricultural Flyers

According to an announcement from the Department of Commerce, the Labor Department has placed agricultural flying on the list of critical occupations in the defense effort, and pilots engaged in this work will receive consideration for deferment by draft boards and in recall to military service.

This action follows recommendations made by various agricultural agencies that dusting, seeding, weeding and defoliating of crops and forests, pest and fire control by aerial applicators are an essential and im-

INTERIOR APPOINTMENTS of the executive DC-3 operated by Signal Gas and Oil Company are displayed in this photo. Note the mural on the cabin bulkhead, the seating arrangements

portant part of our defense preparations. Evidence was presented to an Inter-Agency Advisory Committee by the National Aviation Trades Association that 61 per cent of the pilots doing agricultural flying were subject to the draft or recall. Concurring with the NATA, the CAA testified that use of an airplane in agriculture is growing fast and is every year assuming greater importance in the business of raising crops.

Exec Pilots Hangar-Fly at Remmert-Werner, Inc.

The hangars are humming out at Remmert-Werner, Inc., Lambert Field, St. Louis, and the hangar flying is being done by executive-plane pilots from all over the U.S., overseeing service on their aircraft. A glance at the Remmert-Werner register turned up names well-known to tower operators throughout the country. *G. E. "Buck" Newton,* chief pilot for Pittsburgh Plate Glass Company, was in and then out again after the installation of a new A-12 Sperry autopilot and a fresh 100-hour inspection on Pittsburgh Plate's new executive DC-3. . . . Mexico's *Col. Radames Gaxiola* came in to take delivery of a newly converted and overhauled DC-3 for the Secretaria de Hacienda y Credito Publica de Mexico in Mexico City. . . . *Andy Speyerer,* pilot of Kraft Foods Twin-Beech, and *Lee Snow* of the Whitney Chain Company's Twin-Beech have been in for 1,000-hour inspections and interior rework on their executive planes. We're checking to see if Andy Speyerer is the same Andy Speyerer who used to fly out of Floyd Bennet Field back in the 1930's. . . . *Pete LaFrambois* and *Johnny Courier* brought Wolf Industries' Twin-Beech in for its annual relicensing and a double engine change. . . . *George Martin,* pilot of the Fisher Bros. Construction Company D18S, brought the Twin-Beech in for a double engine change, relicensing, complete rerigging and the installation of ILS and Omni . . . and going through its final conversion stages is a PBY-5A, with its skipper *"Hank" Gausmann* over-seeing the work. This executive plane will sleep eight passengers, and features a built-in shower.

New Sprayer Tanks Developed for Agricultural Flying

Flying farmers are showing a great deal of interest in five new sprayer units announced by Sorensen Sprayers through Dakota Aviation Company, sales agency for Sorensen. Most revolutionary of the new line of sprayers is the seat tank unit for either the *Super Cub* or the Aeronca *Champion.* Fully tested and approved by the CAA as a seat and a tank, it allows the pilot to carry his own flagman or to fly the farmer on an inspection tour of his own fields. This seat tank can be left in the plane at all times—it is strong, comfortable and much more roomy than the aircraft's regular seat. This seat tank carries 53 gallons, and an auxiliary tank that can be attached to the seat tank carries an additional 20 gallons for high-gallonage work. Other models in the line of sprayer tanks are a belly unit for a J-3 *Cub,* PA-11 and *Super Cub;* an 88-gallon inside tank unit for a four-place Stinson; and a 100-gallon inside tank unit for the *Super Cub.*

. . . in the Corporate Hangar

Earl Brane, flying vice president of the Mid-West Tool & Engineering Company, brought the executive D18S into Weir Cook Municipal Airport at Indianapolis for installation of an L2 Approach and Altitude Coupler. The work is being done by Roscoe Turner Aeronautical Corp.

The Pure Oil Company's executive DC-3 is in the shop at Spartan Aero Repair, Tulsa, Oklahoma, for major airframe and engine work, installation of an ARC-15C Omni-Directional receiving set, instrument repair and new headrests. Pilots Marshal Tarbert and Paul Wheeler brought the ship in.

B. L. Clark, co-pilot of Superior Oil Company's Twin-Beech N 44611, flew the plane from Midland, Texas to Dallas and Southwest Airmotive for minor repairs.

R. E. Bixby, pilot of Paul Mantz' DC-3, brought the airplane East to Newark and The Babb Company shop for a spark plug change, induction vibrator installation, radio repair, and engine maintenance and repair.

Larry Sparks, pilot for the Indiana Gear Co., has scheduled his company's Lockheed for installation of ARC Type 17 and 15C omni and a custom Master Panel. The installation will be done by Roscoe Turner Aeronautical Corp., at Indianapolis, Indiana.

Bill Hinkle and Mel Longlet, pilot and co-pilot of the Minnesota Mining and Manufacturing Company's DC-3, brought the ship to The Babb Company's Newark hangar for repair of the right mag and servicing.

Businessman-pilot L. R. Stringer of Wichita Falls, Texas, left his *Bonanza* at Southwest Airmotive for minor repairs while he took care of company matters in town.

Max Pretorious of the Diehl Machine Works in Wabash, Indiana, brought his *Bonanza* in for its second 100-hour inspection since an engine change last November. The work was done in the Roscoe Turner Aeronautical shop.

Douglas B-23 belonging to the Food Machinery Corp., of San Jose, Calif., is flying again after installation of long-range gas tanks, a new heating system, new de-icing system, and radio work by AiResearch Aviation Service Company. Pilot of the B-23 is Dick Lane; co-pilot is George Johnson.

Bendix Aviation's DC-3 is at Mallard Industries, Bridgeport, Conn., for a complete overhaul and a new executive interior.

Stan Smith, pilot for the New York Wire Cloth Company, brough NYWC's *Lodestar* to The Babb Company for a twin engine change. The plane is based at Teterboro Airport.

Two of Gulf Oil's company planes are back in service after re-working at Spartan Aero Repair. The Company Lockheed 12 underwent a double engine change, fuel tank repair and installation of a new one-piece windshield; Gulf Oil's newly acquired *Lodestar* had a 100-hour inspection.

Ed Armstrong and Jimmy Whitfield, pilot and co-pilot of S. W. D. Richardson's Lockheed *Lodestar,* flew the ship from Fort Worth to AiResearch's Los Angeles base for interior work and gas tank sealing.

Ralph Smith and the Evening News Publishing Company's Lockheed *Lodestar* RON'd at LaGuardia Airport recently, en route South on business.

Bill Evans, pilot of the Morrison Knudsen Company's Twin-Beech, brought the ship in for radio installation and a 100-hour inspection. Work was done by AiResearch Aviation Service at Los Angeles.

The Sewick Corporation's Twin-Beech has been in the shop at Roscoe Turner Aeronautical for electrical work. Pilot Dick Whitney brought the plane in. Also at Turner's is the Green Construction Company's Twin-Beech. Bart Stevens flew the ship in for service.

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the members firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 1029 Vermont Avenue, N.W. Washington 5, D. C.

New Members

The Association is glad to welcome the following new members:

D. D. Feldman Oil & Gas, Dallas, Texas, and Los Angeles, operates a Douglas B-23 Executive, based at Love Field, Dallas. Long-range fuel tanks were recently installed by AiResearch, Los Angeles. C. R. Sisto (ATR) of Culver City, Calif., is chief pilot.

Frank Wood Associates, Inc. of Wichita Falls, Texas, are oil-well drilling contractors and oil producers. They have operated aircraft for the past six years, present equipment being a Twin Beechcraft D18C and *Bonanza* B-35. Chief pilot is James O. Kimbrell, Myrt Vititow is pilot, and Lowell C. Tomlinson, copilot-mechanic.

Bravo El Paso!

Cole H. Morrow, wearing his other hat as supervisor of the J. I. Case Co. corporate aircraft operation, reports an incident which should be of general interest to our members. He writes:

"Last December 5th one of our Twin Beech airplanes got trapped in a very bad sand storm near El Paso, Texas, and the pilot was forced to make an emergency landing on a road. It was not possible to fly the plane out of that spot and we were confronted with a rather serious problem.

"Thanks to the fine cooperation and assistance of Mr. C. B. Moore, El Paso Airport manager, Mr. Joe Watts, Asst. Manager, and Mr. William P. West, the Airport Maintenance Foreman, we were able to get the airplane out and back to the airport in short order.

"Not only did they provide transportation to the place of the forced landing, but they also arranged for the grading of a special runway for the plane's take-off. Our chief pilot, Elmo Halverson, as well as Paul Johns, pilot of the Twin Beech, have stated that this is the finest cooperation they have ever received at any airport they have visited.

"I also flew out to the scene, and was advised that it is the practice for either the Airport Manager or the Assistant Manager to personally greet every executive airplane that lands at the El Paso Airport. It is too bad that more airports throughout the country have not recognized the extent and importance of corporation flying and adopted similar measures. All CAOA members should be advised of the excellent job the El Paso airport management is doing."

(Some time ago Forest M. Johnston, pilot for Honolulu Oil Co., San Francisco, passed along a similar commendation of El Paso Airport, under less dramatic circumstances.)

Technical Committee Chairman

Walter C. Pague, chief pilot for ARMCO Steel, Middletown, Ohio, and chairman of the CAOA Technical Committee, spent a very profitable day recently touring the CAA Technical Development & Evaluation Center, Indianapolis, under the guidance of W. E. Jackson, chief of the Electronics Division.

He wrote Mr. Jackson that he wished "more of the CAOA members could see what the CAA is doing to materially aid their pilots with the problems of air navigation and related equipment." We hope to get a few notes from Walt in the form of a Technical Letter to members or for a couple of paragraphs in a forthcoming *CAOA Report* page.

The last time Walt was in Washington he dropped in at CAOA headquarters to report on his efforts to get something rolling on the air-to-ground radio telephone problem. We set up an appointment for him with the Aeronautical Division of the FCC, and we hope there may be something to report on this within the near future.

'52 Forum in Chicago

Following the generally successful Fourth Annual Forum in Washington last June, the CAOA board of directors have decided to hold the 1952 Forum in Chicago, early in June. This is advance notice only, so that when fuller details are sent within the next few weeks it will ring a bell.

In one important respect none of the Washington CAOA Forums can be regarded as wholly satisfactory—member attendance. It is believed that a much higher percentage of member company executives and pilots will be able to attend a Forum in Chicago.

The directors are convinced that the high standards as to speakers and papers set at Washington last year will be maintained.

As soon as you receive word as to exact date and place, mark your calendar!

RTCA Assembly

By virtue of our Association's participation in the activities of the Radio Technical Commission for Aeronautics and membership on its Executive Committee, all CAOA members are entitled to attend the spring and fall RTCA Assembly meetings.

The Spring Assembly will be held in Washington on March 25th and 26th, the theme being "Air Traffic Control in the Terminal Area," with special reference to radar traffic control techniques and procedures.

Meetings on the first day will be at the Shoreham Hotel, with technical papers at the morning session and a series of talks by representatives of user groups in the afternoon. These will include airline operators, airline pilots, corporate aircraft operators and private pilots.

The second days will be devoted to a CAA-conducted tour of inspection of all facilities at the Washington National Airport, including tower, center, radar traffic control center, etc.

It is hoped that a substantial number of CAOA members may be able to attend.

Corporate Aircraft & Income Tax

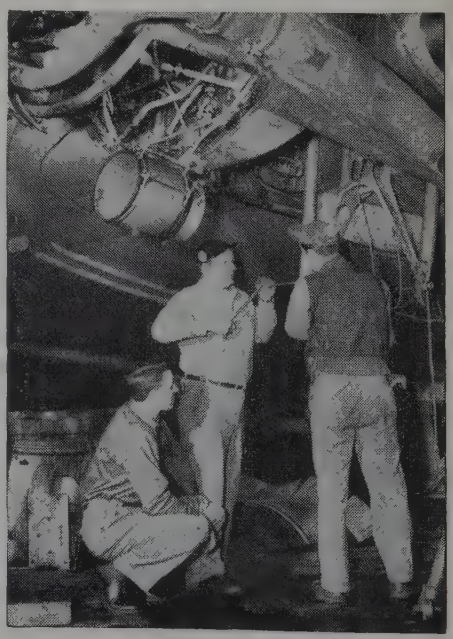
In response to a long distance call last fall, the CAOA Washington office supplied the law firm of Sandler and Rosenberg, Des Moines, Iowa, all available material to help them prove their contention (in connection with an Internal Revenue case) that the cost of operating a company airplane was an "ordinary and necessary expense of operating a retail farm implement business in the midwestern area."

The operating expenses, depreciation and casualty loss (the plane was wrecked in a crash during 1951) were not only disallowed to the corporation, but were also charged back to the president as additional income, thereby amounting to a double-barreled disallowance.

Some weeks later a letter from Mr. Robert G. Sandler informed us of complete success in the case, and that the reprints of magazine articles and copies of studies we had prepared for government agencies had been introduced by him as supporting evidence.

A more recent letter from Mr. Sandler summarizes the facts of the case, with some comments on current Internal Revenue thinking in connection with corporation-owned aircraft. A letter on this has been sent to all members of CAOA, and copies are available to other interested parties upon application to N. F. Silsbee, Exec. Sec., CAOA, 1029 Vermont Ave., N.W., Washington 5, D. C.

MECHS at Babb Co. check landing gear on an executive C-47 in for an overhaul

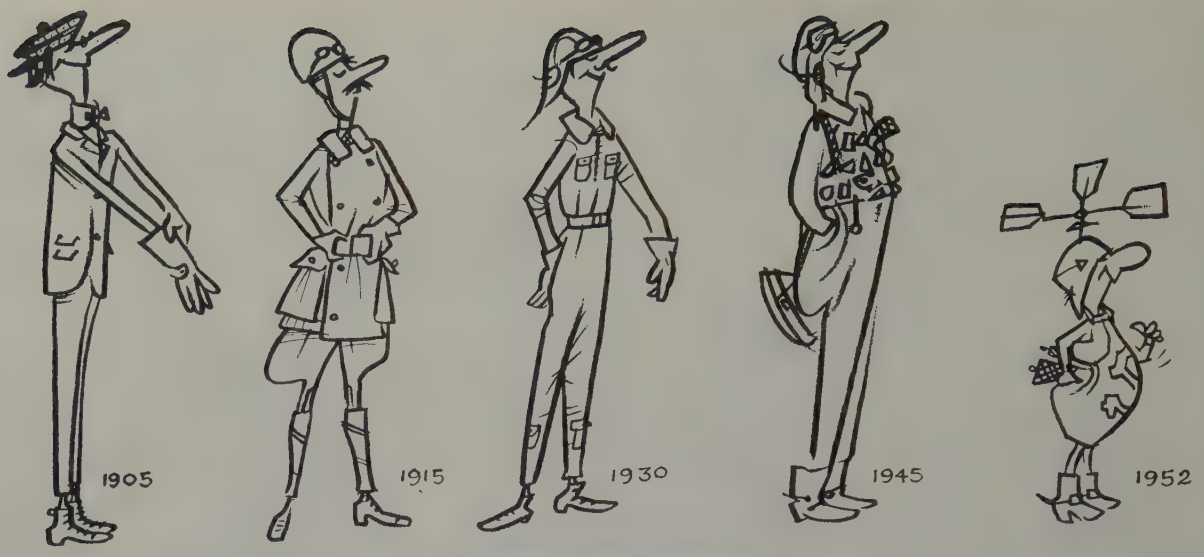


S.N.C.A. SUD-OUEST is experimenting with turbojet auxiliary power for a DC-3. The turbojet is a *Palas* offering 331 pounds static thrust. It burns kerosene at a rate of 1.22 pounds per pound of thrust per hour, and the whole unit weighs just 132 pounds. Unit is 41.5 inches long

Jet Boost for DC-3

Despite the introduction into service of newer and better performing twin-engine transports, the "old faithful" DC-3 continues to be a favored medium transport, now seeing service as a corporate executive airliner and as a short-haul plane in airline use. A number of attempts are presently being made to improve the DC-3's performance and to extend its life. Latest experiment has been the fitting of an auxiliary turbojet unit to the underbelly of the DC-3 for an increase in take-off power and extra climb power. This work is being done in France by S.N.C.A. Sud-Ouest in conjunction with Turbomeca and Fouga. Tests have not been completed, but this increase in power is expected to permit an increase in take-off weight within ICAO regulations. The small turbojet unit, *Palas*, develops 331 pounds static thrust, and has been fitted at the center line of the fuselage near the trailing edge of the wing. The *Palas* unit is 41.5 inches long, has a diameter of 16 inches, and weighs 132 pounds. It is a turbojet with a single-stage compressor, annular combustion chamber with rotating fuel delivery ring, and single-stage turbine with 31 blades, preceded by a stator with 20 air-cooled vanes and having 35,000 rpm. The *Palas* burns kerosene at a rate of 1.22 pounds per pound of thrust per hour. The *Palas* unit had passed its 150-hour tests under the required ICAO conditions even before it was fitted to the DC-3 for experiments.

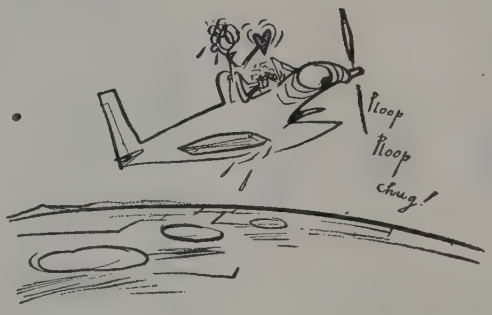
PALAS turbojet unit is mounted at centerline of DC-3 fuselage near the trailing edge of the wing. Unit has 16-inch diameter



DILBERT

By S. H. Warner and R. Osborn

Confused and Contused—When his engine coughed and quit at 4,000 feet, Dilbert cleverly deduced that his gas tank must be running dry. So he shifted from reserve to right main. When his engine didn't pick up, however, he shifted right back to reserve.



He never did make a conscious decision whether to bail out or land; all his efforts were bent on starting that engine. At 1,000 feet he lowered his wheels. At zero altitude he landed in a plowed field. Shortly after contact he turned over. That's when he got the contusions.

Investigation showed the reserve tank was empty and the right main almost full. It wasn't necessary to page Sherlock Holmes on this one. Very evidently Dilbert had not shifted tanks until after fuel pressure was lost, and thereafter he employed faulty procedure in attempting to regain suction.

Lest others get confused during this emergency, here's a quick recap of main steps necessary to regain fuel suction:

a. Shift to proper tank, with a positive visual check of selector valve position.

b. Switch on auxiliary (*Continued on page 56*)

"Pity the control tower boys when a Dilbert shows up!"

BRITAIN'S first jet bomber squadron, No. 101, lines up at Binbrook base. Now flying *Canberras*, squadron formerly flew RAF *Lincolns*

. . . from Western Europe

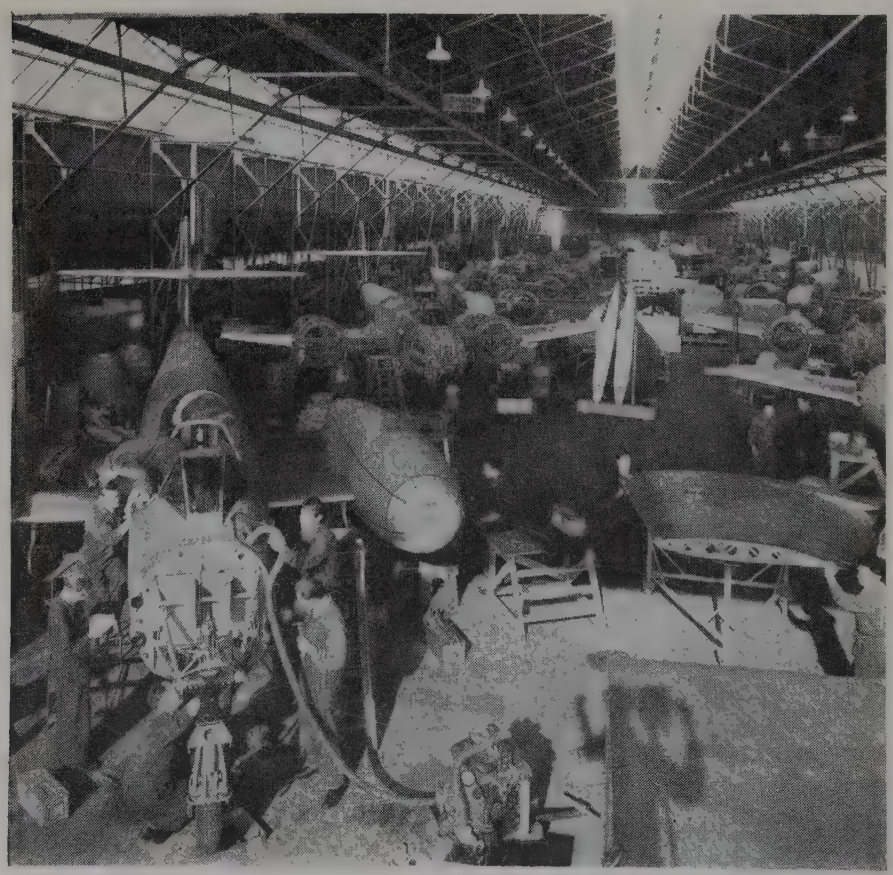
(*Continued from page 27*)

Vampire will switch to the *Venom* towards the end of the year. In the meantime, *Venom* production in Britain is gaining momentum and squadron strength is being built-up.

During the construction of the *Vampire* at Marignane, the French decided to develop a more powerful *Vampire* with a higher-powered turbojet as an interim production machine until *Venom* production commences with the availability of regular deliveries of the *Ghost* turbojet which powers the latter airplane. Known as the *Mistral*, or *Vampire* 53, the improved French version uses a 5,000-pound thrust double-sided impeller-type *Nene* in place of the 3100-pound thrust single-sided impeller-type *Goblin* 2. In order to provide the extra air needed for the rear face of the *Nene's* double-sided impeller, redesigned and larger air intakes had to be adopted, and extra fuel tanks were incorporated to feed the thirstier *Nene*.

However, a notable improvement in performance was achieved; top speed being increased from 531 mph to 578 mph at sea level, and whereas the *Vampire* climbs to 21,325 feet in 7 minutes 38 seconds, the *Mistral* reaches 32,808 feet in that time. The exact number of *Mistrals* to be built is not known, but current schedules call for some 450 *Vampires* of all types for *Armee de l'Air* (French Air Force) fighter elements.

METEOR 8 jet fighters are shown here in production at the Fokker factory in Holland



Specialized Interceptors for 1954-55

The whole problem of bomber interception has become increasingly difficult with the advent of faster bombers. In the past, one of the fighter's main advantages over the bomber has been its greater maneuverability; the balance of firepower and speed has swayed to and fro, but the fighter has always succeeded in keeping ahead in maneuverability. Now, however, the bomber is winning a lead in maneuverability by flying at very high altitudes where the fighter is limited to normal accelerations of roughly the same order as its target.

This limitation is due to the convergence of the stalling and compressibility limits as altitude increases, and although the situation may be eased with the debut of the new generation of supersonic fighters, it has yet to be proved that this increase will be enough to give the margin the fighter needs to deliver the death blow, for the fighter must turn *inside* the bomber to keep it in its sights, thus suffering a higher acceleration. To keep a high-speed bomber in its sights in a 2 g turn, the fighter would have to apply up to 5 g's in a stern attack and something like 8 g's in a head-on attack. Therefore, it is essential that the fighter be able to guarantee a kill at the first attempt for, as the fighter would have to make a wide, sweeping turn after its first pass, the bomber might easily have reached its target before the fighter is positioned to make a second pass.

Fortunately, it has at last been realized in Europe that no matter how aerodynamically exquisite and brilliant a performer a fighter may be, if it is ineffective as a killer it is so much wasted effort. In recent years

(*Continued on page 42*)

PLANE FAX

Quick picture of

NOGALES INTERNATIONAL AIRPORT

Nogales, Arizona

6000' paved runways, lighted on request. Full maintenance, weather information. Cafe, limousine service. Airport of entry to Mexico. Both American and Mexican officials on field every day. Complete Standard Oil Aviation Service.

Skyway aid for border bound flyers

George Oberdorf, Director of Nogales International Airport, makes this report on the increasing number of private business planes crossing the border . . .

"Here in Nogales, we're at a natural crossroads between the United States and Mexico—and since the war, the number of private planes making the crossing has steadily increased to about 500 a month. Construction men, industrial and agricultural executives—men whose time counts—have found that it pays to fly in terms of time and dollars saved. That's why so many businessmen with interests in Mexico are now travelling by private aircraft.

"And more private planes cross at Nogales than any other airport on the U. S.-Mexican border. Before they cross, many of them count on us for a final Standard Aviation check-up—and, of course, they fill up with RPM Aviation Oil and

Chevron 80/87 Aviation Gasoline. Where dependability counts, businessmen know that 'RPM' and Chevron are their best buys for clean engine performance and long-range economy. That's why so many of them ask for Standard Oil Aviation products by name—and take a few spares of 'RPM' along as they head south across the border."

TIP OF THE MONTH

George Oberdorf suggests:
"Stand by when your plane is being serviced. You'll pick up valuable 'know-how'—and have a double check on easy-to-forget items like a loose cowling or cap."

It's in the Bank

(*Continued from page 13*)

in flying and my theory that altitude should be lost in a turn to be safe, the pilot asked one interesting question: "Supposing you have an 18 year old son with 25 hours solo time. Would you rather have him subscribe to the theory that increased angle of bank decreases the stalling speed, or would you rather have him heed our warning and avoid steep banks close to the ground?"

I thought about this for a time and came up with the following conclusion:

Dad: "Do not make steep banks close to the ground."

Son: "Yes, father."

Now let's talk about fatal stalls involving commercial pilots with more than 3,000 hours (there was a higher rate of fatal stall accidents in this class last year). To them I make this summary to pass along to their students:

1. Unlike public conception, the angle of bank *alone* does not determine the airplane's stalling speed.

2. An airplane could have a higher stalling speed at a low angle of bank and vice versa. This is particularly true when the same radius turn is attempted in both cases.

3. In making a marginally safe turn (it is assumed that the pilot did not get into this situation voluntarily), use bank in preference to elevator.

My pilot friend asked one other question. "What if there is no altitude to lose?"

If there is no available altitude to lose and yet an excessively tight turn must still be made . . . . don't make it.

Jet Push Home Possible?

(*Continued from page 11*)

stack of proven formulae in the back of his head, the designer approached the problem this way.

With the actual contact of two airplanes, the pilot of the front aircraft—presumably the one with a flame out or battle-damaged powerplant—would have to do all the flying. If the rear pilot pulled back on his controls, he would raise the tail of the leading aircraft and both planes would go down. The rear pilot would have to keep his hands and feet free of the controls with the exception of the ailerons to roll his "pusher" in following the turns of the front aircraft. Any other control of the rear airplane would upset the applecart.

The more power used by the pushing airplane, the more tendency the system of compression would have to buckle. If he throttled back too far, the planes would pull apart. Naturally, the rear plane would throttle back over the airport and each would land separately.

Dive brakes or flaps could not be used by either pilot at the time of contact between the two planes since closing dive flaps, located on the bottom of the fuselage, tends to make the nose go up and the whole airplane drop. Initial contact would have to be made by the rear airplane in a clean configuration using only engine thrust to push the nose into the tail pipe of the crippled aircraft.

This type of pushing could be done most easily by jets having their air scoops located at the leading edge of the wing—like the F-80 and F-94.

The research men foresaw only minor damage to the nose or tailpipe of models equipped with machine guns in the nose. Those with electronic radar equipment would probably suffer slightly more damage. However, there should be none of the bumping or springing back in pushing a jet airplane that is found in pushing one automobile with another. There are no spring steel bumpers on a jet and any appreciable tendency to spring back at the time of actual contact would be eliminated by the crumpling of the thin metal on the nose of the pushing airplane. The physical energy generated at the time of contact would be absorbed by the bending of this "thin tin."

For the best stability and control after contact, the front airplane should be slightly nose-heavy and the "pusher" slightly tail heavy. The pilot of the pushing aircraft should empty the ammunition from his guns in order to change the center of gravity of his airplane to a point as far back as possible. Since tip tanks are mounted almost on the center of gravity, they enter into the problem only in that they add a little drag and increase the effective span of the wing. Therefore, they should not be dropped in this operation because the pushing airplane will need at least one-third more fuel to get both airplanes back to their base.

The following statistics come out of a slide-rule when applied to a theoretical 500-mph jet. Contact should be made at roughly 375 mph. It will take roughly 1200 pounds of thrust to keep one jet in the air at 30,000 feet, and double that—2400 pounds—to get both airplanes back home. The drag of both airplanes will be 1.8 to 1.9 times as high as that of the single airplane because of a slight loss of boundary layer drag from the "pusher."

The design men took a more skeptical view of the pushing idea with jets having a single nose scoop like the F-84 or F-86.

The latest F-86 with the "eyebrow" sticking up atop the nose scoop would probably work out as a "pusher" because the "eyebrow" could be used to jam into the tailpipe of the crippled aircraft. By mis-matching the planes with the rear airplane on the low side, a certain amount of engine efficiency could be retained.

With a full nose-scoop like the F-84, the flame-out altitude would be drastically lowered by requiring the rear engine to operate solely on air that rammed through or leaked around the non-operative engine of the front airplane. Specific fuel consumption would be extremely high and the resulting thrust would be greatly reduced.

"It would take a lot of powerplant research to prove whether or not that F-84 or any similar type could be pushed successfully," said one of the slide-rule men. "From a quick look, it seems questionable."

The reason that this pushing of jets becomes a possibility lies in the basic clean configuration of modern fighters. They have a glide ratio as high as 30-to-1. One fighter pilot ran out of fuel 100 miles off the Florida coast at 30,000 feet, yet landed safely at his home airport. Herman "Fish" Salmon, Lockheed factory test pilot, made a low pass in a two-place T-33, over the shoreline at Long Beach, California. He had a newsreel cameraman aboard. Fish shut off his power and glided 35 miles up over Los Angeles to the Van Nuys Airport.

The jet has an added advantage of no whirling propellers to snip at the tail of the airplane being pushed. The technique of towing airplanes or gliders is, in many respects, more complicated than that of pushing since the aircraft without power must operate in the turbulent propeller wash of the tow plane.

The actual physical contact of two airplanes together in the air is not new. A British "piggy-back" aircraft has flown and the McDonnell parasite fighter, built to tuck away in the bomb bay of a B-29, has been tested. The air launching of all the supersonic XS-1 series of experimental aircraft involved two airplanes flying while in rigid contact with each other.

The actual pushing of jet fighters may sound like fantasy. The aerodynamacists caution jet pilots *not* to attempt it—unless or until a group of expert engineers have had a chance to analyze the problem in detail. There is a feeling among some aerodynamacists that a study contract should be awarded to permit them to really delve deeper into the subject. Say they, "The saving of one modern fighter would more than pay for the research necessary to completely prove—or disprove—the problem."

While it did not involve a power failure, the recent high-flying-rescue of Capt. John I. Paladino in Korea sounds as much like fantasy as the story of one jet fighter pushing another. This experience, however, is completely documented.

Capt. Paladino's rescue has been given world-wide coverage in both magazines and newspapers. Briefly, here's what happened. Capt. Paladino, flying an F-84, passed out from an oxygen failure at 32,000 feet. His two

wing men, Capt. Jack Miller and Lt. S. Wood McArthur, followed his erratic flight. They pulled into such tight formation with him that the boundary layer pressure from their tip tanks made it possible for them to guide the unconscious pilot away from the 38th Parallel and down to 13,000 feet where Capt. Paladino regained consciousness.

Fantastic—but true.

Even during World War II there were many mid-air rescues of one type or another. During the evacuation of the Liliang Airport in China, as many as six F-51's rode the wing of a C-46 transport up through the overcast and westward to the comparative safety of the Kunming area.

A somewhat similar "save" happened to this SKYWAYS reporter during a tour of duty on the Burma Hump. A dusty log book shows the date of February 14, 1945. The airplane was C-46 #43-427072. I was giving a route check to a Lt. Toombs. As usual, the weather was stinking and we had climbed to 23,000 feet approaching Kunming, just barely on top of a very solid overcast.

We called in for landing clearance and the tower asked if we were on top. We replied "affirmative," and they asked us to stay there. Two of General Chennault's F-51's were on top, returning from a strafing mission, and almost out of gas.

By using a little sailplane technique—soaring the 24-ton C-46 on top of the roll of the clouds—we picked up an extra 400 feet and the fighters were able to pick us up.

With an F-51 glued to each wingtip, we were cleared by the tower to come in.

"Zero seven two," said the tower. "Make your let-down at above 160 mph so that you won't stall the fighters out."

Our winds at 23,000 feet were above 120 mph that day, and it took 45° of drift correction to keep the three-plane formation over the Kunming marker. This was in the days before airborne radar or GCA units outside the Continental limits of the United States, and the fighters had insufficient instruments to make an ADF let-down.

The Kunming field had been reporting a 1200-foot ceiling, but the ceiling let down while we let down. We passed through all the weather in the book: clear ice, rime ice, the turbulent mixing area and then driving rain. Because of their excellent formation training, the fighter pilots were able to stay with us even though we had no radio frequency to talk with them directly. We made our procedure turns and hoped they'd stay with us without nipping at our ailerons.

On our final approach over the town of Kunming, the altimeter wound down to a thousand feet above terrain, and we were still in the soup.

For one grim instant, a thought passed my mind. "If this let-down isn't right, there's going to be an awful splash."

Then the busy Kunming Airport materialized through the fog and the last we saw of the fighters was the bottoms of their wings as they peeled off and headed for home. They landed with less than 10 minutes of fuel remaining, and we received a nice letter some months later from General Chennault.

Saves of this type were so frequent, however, that the incident was worth only a couple of paragraphs in the ATC India Wing paper, "*The Hump Express.*" During those days, it seemed as though some pilot in a transport was getting a smaller airplane off the hook every few days.

So this idea of one airplane saving another airplane is nothing new. In propeller-driven aircraft it is usually a visual reference affair in which another plane is guided in for a safe landing. The F-84 trio in Korea was much closer, using actual air pressure from tip tanks to steer a plane with an unconscious pilot.

During in-flight refueling, there is a small percentage of towing to keep tension on "Clancy's" boom.

Along the same line, further research into this problem might well show that shipboard Navy planes could help keep other aircraft from crashing into the sea. A rugged arresting hook is standard equipment on all shipboard aircraft. In the jets where there is no propeller to interfere, it might be possible to install a manually controlled loop into which this arrester hook could be dropped to tow home a plane either crippled or out of fuel. That Navy slogan "The difficult we do immediately; the impossible takes a little longer" could apply here.

From an operational standpoint, his in-flight hitch-hiking has an interesting potential. From a theoretical aerodynamic standpoint, it stands a good chance of being practical. If—and still a big *if*—it works, the saving in aircraft and pilots would be more than gratifying.

Who knows, someday a fighter pilot might pick up his microphone and say, "Hey, Bud. This engine's running sour. I'm going to shut it down so will you please gimme a shove to the next airport?"

Stranger things have happened in aviation.

. . . from Western Europe

(*Continued from page 38*)

air armament has been completely outstripped by airframe and engine design. All Western European fighters at present in service mount four 20-mm guns as compared to the .5-inch Colt-Browning of most U. S.-supplied fighters. These guns have assumed something of the legendary character of the Kentucky rifle, and the Russians are already using weapons of considerably increased caliber in their fighters.

It is difficult to believe that tomorrow's fighters will have so much speed over *tomorrow's bombers* that they will be able to afford the external stowage of air-to-air missiles. Thus, we must look to guns of heavier caliber than the 0.5-inch and 20-mm weapons, and the answer seems to be the fast-firing 30-mm gun; such a gun is scheduled for installation in all the next generation of specialized single-seat interceptor fighters now being developed for West European squadrons and likely to first see service in 1954-55.

One such fighter, carrying a battery of four 30-mm guns, that is under development in France by the S. N. C. A du Sud-Ouest is the *Espadon*, dubbed by the manufacturers as a "bomber destroyer." The *Espadon's* singular characteristics are the size and length of the fuselage compared to the diminutive sweptwing and, in its initial form (SO 6020), an inefficient ventral intake and an abnormally long cockpit canopy (necessitated by a belated Air Ministry request for an ejector seat).

Initial trials were disappointing and the machine proved to be quite a handful; the gross weight of around 17,650 pounds resulted in a frightening wing loading, and the landing speed was something of a pilot's nightmare.

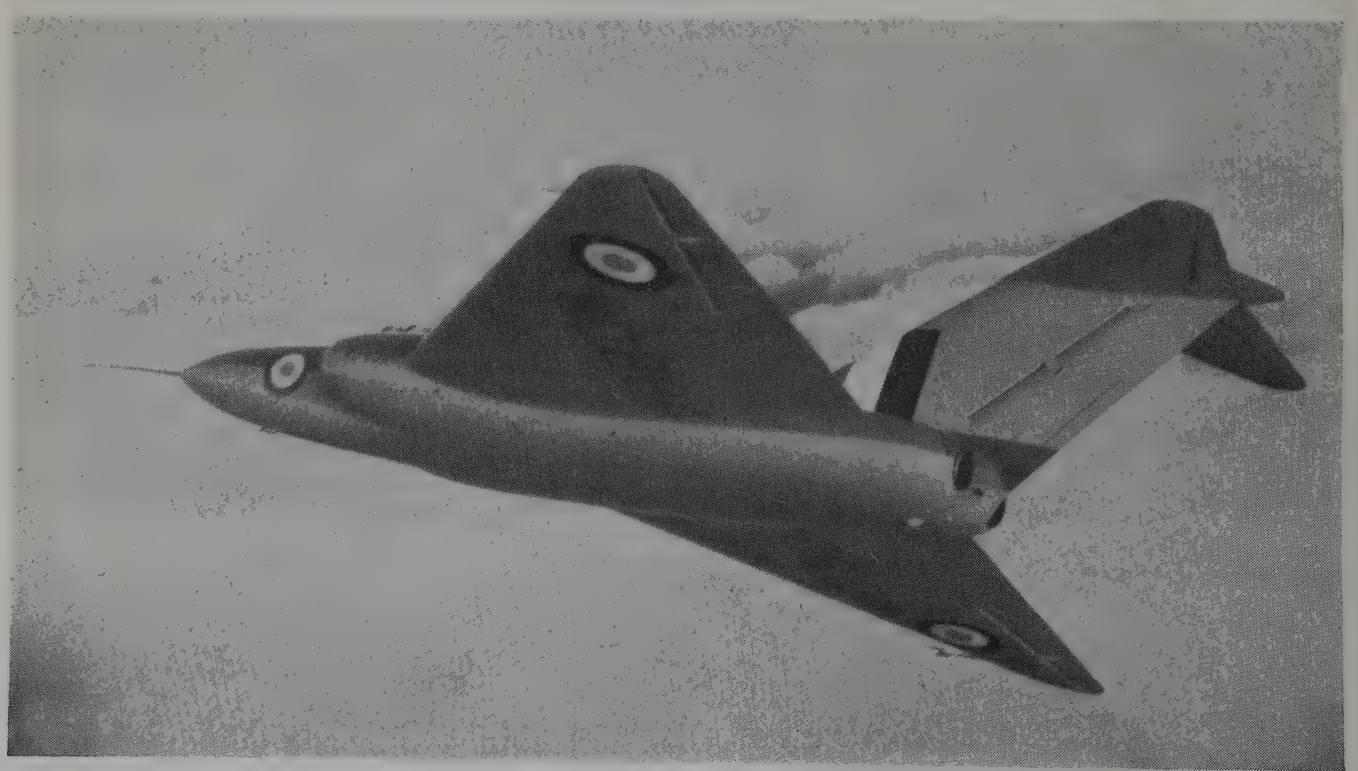
VAMPIRE 5 is presently in production in France; will soon be replaced by DH *Vampire*

However, undaunted, the design team redesigned the *Espadon* in a series of new forms: the second SO 6020 had intakes resited at the fuselage sides aft of the wings; the SO 6021 had a redesigned tail unit, smaller cockpit and considerably reduced all-up weight, while the SO 6025 and SO 6026 versions incorporate S.E.P.R.-251 bi-fuel rocket motors to overcome the inadequate thrust of the single *Nene* turbojet. Mach numbers of the order of 0.94 have been achieved in level flight with the revised *Espadon*, and Major Charles Yeager, who tested the SO 6021 version, declared that its new Leduc-Jacottet servo-controls are the best that he has tested and surpass comparable U. S. designs. But the *Espadon* is still labelled "experimental" and, as each month of testing passes, the likelihood of its ever gracing a production line diminishes.

The Dassault MD 452 *Mystere* (SKYWAYS, March) is a logical development of the MD 450 *Ouragan* which it will presum-

(*Continued on page 46*)

GLOSTER G.A. 5, Great Britain's first operational Delta-wing fighter, is photographed here on its first flight. Note swept tail



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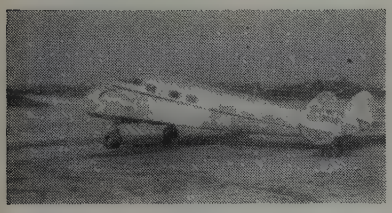

LOCKHEED 12A'S—2 FOR SALE— Corporation owned, #400SS, has 193 hours since aircraft, engines, and hydromatics major overhauled. Auxiliary tank. De-icing. Reupholstered. Excellent radio. Original owner. Beautiful bright clean condition. $30,250. Consult **POWERS & GEORGE.** "Airplanes Everywhere."

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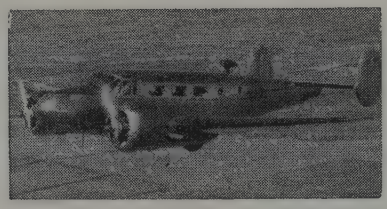
NAVION SUPER 260'S—4 FOR SALE —1950, #525PKS, has 220 hours. Engine 170 hours. ADF. All late improvements. All bulletins up. Hangared. One owner. Never damaged. New condition. $17,500. For details, location, and inspection arrangements consult **POWERS & GEORGE.** "Airplanes Everywhere."

SWIFT 125'S—20 FOR SALE—$2000 UP. 1951, #245QVS, has only 157 total hours. Aeromatic. Primary blind instruments. Radio. Manifold pressure. Cylinder head temperature. Undamaged. Hangared. One owner. New condition. Bargain. $3500. Consult **POWERS & GEORGE.** "Airplanes Everywhere."



BEECHCRAFT D-18-S TWINS—13 FOR SALE—$43,000 UP. 1946, #8017RS, has constant speed props, best equipment, deicing, and 3 zero engines. $55,000. Make offer. Also; 1946 Executive #63PS, with hydromatics, best equipment, de-icing, and 2-zero engines. $67,500. Consult **POWERS & GEORGE.**

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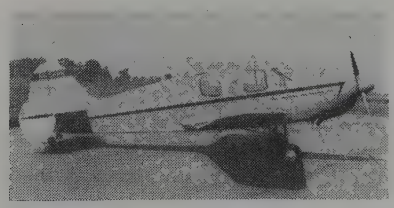
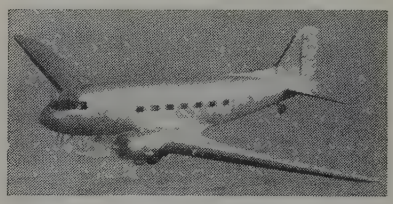


BELLANCA CRUISEMASTERS—3 FOR SALE—1950, #659GNS, has only 200 total hours. 190 hp. engine. Cruises 175 MPH. Auxiliary tank. Metal controllable propeller. Omnirange radio. Cost over $15,000. Hangared. Flies and looks like new. Bargain. $9750. Consult **POWERS & GEORGE.** "Airplanes Everywhere."

GRUMMAN GOOSE AMPHIBIANS—2 FOR SALE—Executive, #6837PS, has 1150 total hours. Engines and constant speed propellers major overhauled. Electric gear. Divan. Chairs. Closet. Good radio. ADF. Exceptional condition. Bargain. $37,500. Consult **POWERS & GEORGE.** "Airplanes Everywhere."



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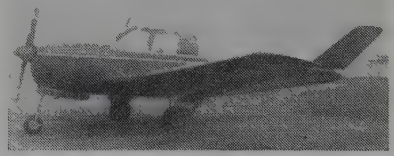
VENTURAS—4 FOR SALE—Licensed, #150FS, has open interior. P&W 2000 hp. engines major overhauled. Airline instruments and radio. No corrosion. Clean throughout. Undamaged. Asking $55,000. Offer wanted. For details, location and inspection consult **POWERS & GEORGE.** "Airplanes Everywhere."



BEECHCRAFT BONANZAS—28 FOR SALE—$6750 UP. October 1949 painted model A-35, #872ZAS, has 250 total hours. New 205 hp. engine. Auxiliary tank. Gyros. VHF transmitter. Undamaged. One owner. New condition, $12,000. For details consult **POWERS & GEORGE.** "Airplanes Everywhere."

ALL TYPES OF AIRPLANES AVAILABLE—DETAILS UPON REQUEST—LISTINGS SOLICITED

Watchers to the West

(*Continued from page 15*)

"Their job," said Captain Johnson, "is to fill in the blanks, not only in low-level detection but in other respects. For example, they can tell us whether the plane crashed or dropped a bomb. They can help track a guided missile. The big advantage of having people watching," he summed up, "is that they can both see and hear—and radar can't."

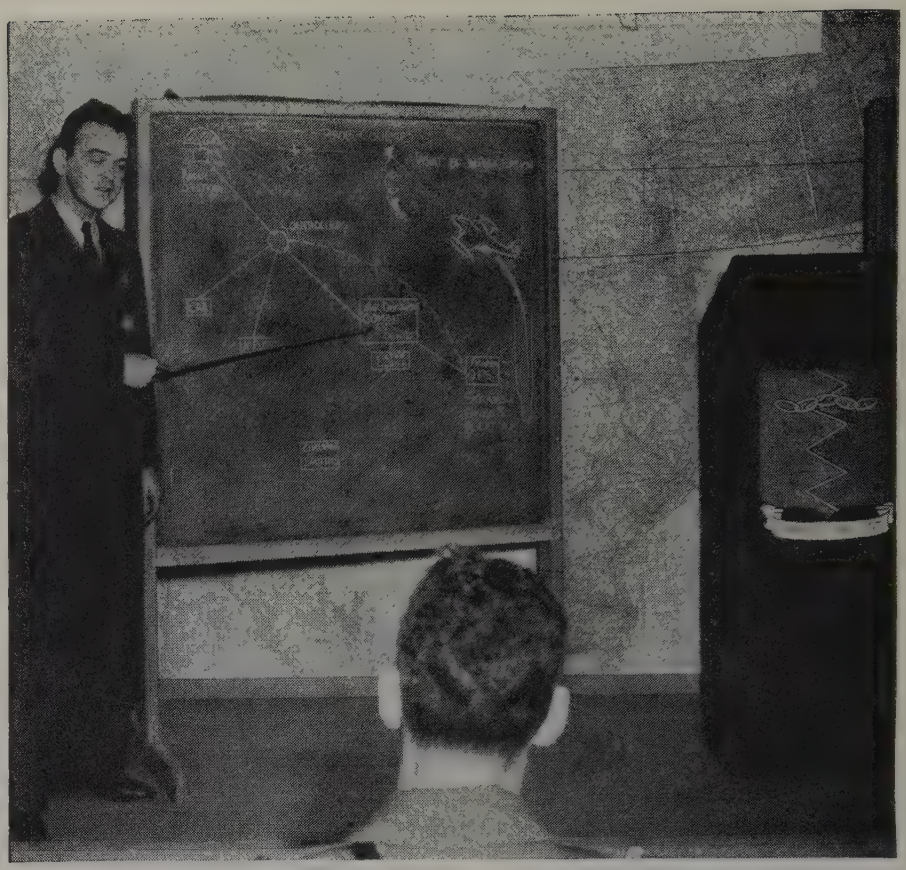
After detection, the job of interception is up to the fighter pilots, working with the radar watchers on the ground.

Everybody in air defense is working with somebody else, and the teamwork is only as good as the communications between the elements of the team. Communication is one of those elements which will, alone, never win a war. But without it, a war could be lost.

"Communications are a major part of the setup," General Parker said. "Of course the best communications in the world are no good unless some information is there to be communicated."

But if communications were knocked out or jammed, the best interceptors and the fastest scramble in the world would be just empty gestures. The pilots would have no way of knowing which way to point their guns.

The Western Air Defense Force realizes this, of course. They have taken steps to see that their comm net isn't blocked. Among them are multiple channels of radio communications and land telephone lines on the ground.



OPERATIONS OFFICER Major J. M. Winkler explains how air defense works to civilian volunteers

SCRAMBLE—Pilots of the 82nd run for their planes on signal from radar boys

"Jamming won't put us out of business," General Parker remarked, "but it's still one of our major problems. We are taking steps to combat it."

Those steps have to be speedy ones, too, for, as Parker said, "seconds will count in the showdown."

And in the WADF, nobody ever knows when the showdown will come. Every time the scramble klaxon sounds in the ready room, the pilot rushing to his F-89 expects to fire his loaded guns.

Those seconds ticking an enemy bomber closer to the Golden Gate haunt the ready rooms. The pilot—the striking arm of the air defense force—who sits relaxed in the leather chair and quietly munches a sandwich is just as much aware of those seconds as is General Parker. He knows that his sprint across the apron to the plane has got to be a fast one. He knows that the precious seconds it takes to touch off his two jet engines have to be shaved every day, whether he himself has the leisure to shave or not. He is jealous of the slow taxi to the end of the runway.

Once airborne, however, he doesn't have to waste any time at all. The last three steps of the air defense mission are all up to him: interception, identification, destruction.

One squadron of the 78th Fighter-Interceptor Wing at Hamilton Air Force Base, near San Francisco, racked up a 4-minute 43-second average for a whole month of operations. That's 4:43 from the time the klaxon sounded to the time of reporting in to the air control center, some 30 seconds after getting airborne.

That squadron, however, was flying F-84's, with only one engine to crank off. The F-89 boys take a little longer, but they're still pretty fast. They figure on averaging around 5 and a half minutes.

And the F-89 *Scorpion*, made by Northrop, is quite a hunk of airplane. It's big, sitting up on top of two underslung jet engines. It has to be big to carry two men and a complexity of radar gear and armament.

And it's fast—in excess of 600 mph. It will perform above 45,000 feet, with the crew of two riding on ejector seats in a pressurized and refrigerated cockpit.

The *Scorpion* is built by Northrop and powered by two Allison J-35-A-21 engines developing 5,000 pounds of dry static thrust each with afterburner.

A good deal of the performance is still secret, but it must be pretty terrific. Those two crewmen, pilot and radar operator, are sitting 17 feet 7 inches off the ground before they ever start to move, and they have more than 40,000 pounds of airplane to control. To make them feel a little safer, there is thick armor plate and armor glass in front of them.

For armament, the *Scorpion* carries six 20-mm cannon and can also tote 16 five-inch high velocity rockets. When used as a bomber or fighter-bomber, it can carry 3200 pounds, which means any number of combinations of rockets, fragmentary bombs or high explosive weighing up to that much.

Wing span of the F-89 is about 56 feet 2 inches, and length is 53 feet 4 inches.

The nose is loaded with radar gear for hunting down enemy planes at night or in heavy weather. The radar operator with his scope sits behind the pilot. The plane is effective at a combat radius of up to 500 miles.

The engines, which lie sleekly underneath

(*Continued on page 48*)

Typhoon Finders

(*Continued from page 17*)

While a typhoon is still far out at sea, the Air Weather Service WB-29's and their crews roar out to penetrate this destructive weather phenomenon and to chart its force and direction.

While in the center of the tropical cyclone, an operator in the rear of the aircraft releases a dropsonde. A miniature weather station, complete with weather instruments and a tiny radio transmitter, the dropsonde falls by parachute to the earth's surface at a speed of about 100 feet per minute. Six times each minute during its descent, the dropsonde's radio transmits in code the temperature, relative humidity, and atmospheric pressure of the air masses through which it passes, to the dropsonde analyst aboard the WB-29, who listens in and copies the information as it is received.

The data thus collected is only a small portion of the meteorological requirements. Also required are the highest wind velocity, the geographical position of the typhoon, the direction of its movement, its turbulence, pressures, and cloud coverage. All of this pertinent data must be known, so that an accurate forecast may be made to military installations, aircraft, and ships at sea which may be in the path of the approaching typhoon. By being alerted, they can take necessary precautions to keep loss of life and property to a minimum when the full fury of the typhoon is unleashed. The WB-29 crew must fly three or four hours in the storm area before all of the required data can be computed.

In the vast expanse of the Pacific, the 56th Strategic Reconnaissance Squadron, based in Japan, and the 54th Strategic Reconnaissance Squadron, based on the island of Guam, often team up to chart the movement of typhoons that originate in the Southwest Pacific and sweep all the way into Northwest Pacific areas.

This teamwork was demonstrated in the case of one of the most recent of the Pacific typhoons. Typhoon "Marge" was first reported by the 54th Squadron approximately 275 miles west of Guam. The squadron's WB-29's flew 13 missions in following the typhoon to a point about 75 miles north of Okinawa, where the 56th Squadron took over responsibility for reporting the storm data to the Tokyo Weather Central. The 56th flew seven missions before the storm diminished in velocity and hit the west coast of South Korea, where little or no damage was done. Further reconnaissance was considered unnecessary.

The map photograph (*page 16*) shows all of the fixes made by WB-29's from both weather squadrons from the time the storm reached typhoon proportions until it passed over Korea.

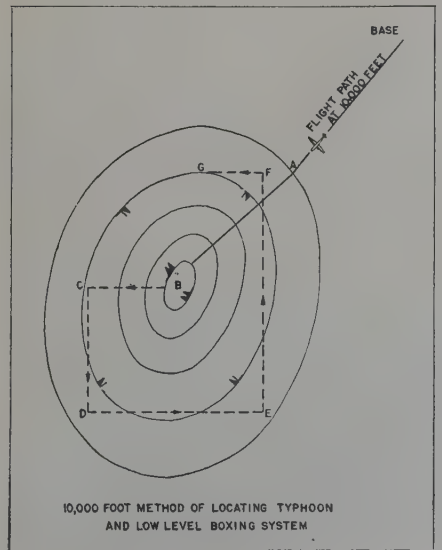
Once the existence of a closed low-pressure area is established, daily flights are made by weather squadrons to determine whether the tropical cyclone is developing into a typhoon, which is defined as a tropical cyclone having maximum winds of 64 knots (about 75 mph) or greater. When it has been definitely determined that a typhoon is present in a squadron's area of responsibility, two fixes on the storm are made each day until the winds diminsh in velocity and all danger to personnel and equipment has passed.

There are five accepted methods used in tropical cyclone reconnaissance, of which the 700-millibar (about 10,000 feet above sea level) method of locating the typhoon and the low-altitude (1500 feet) system of "boxing" the "eye" are typical. The low-altitude boxing system is the most efficient means of locating the center (or "eye") of the low-pressure area when the eye is not sufficiently defined to be accurately located by any other means.

The accompanying chart shows the approximate flight path of the WB-29's as they enter the storm area and, finally, the eye itself, prior to letting down to an altitude of 1500 feet some 50 or 60 miles beyond the eye to perform a boxing of the typhoon. The majority of the last seven penetrations of Typhoon "Marge" by the 56th were made by this method.

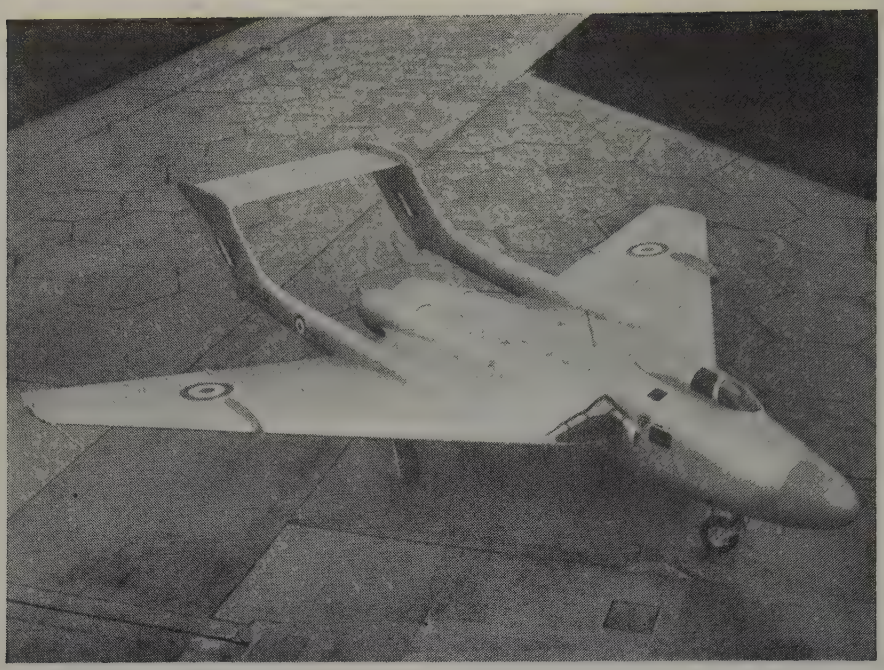
This past year the typhoon season started in the Pacific Ocean area in early August and during that season many tropical cyclones entered or developed in the area patrolled by the 54th and 56th Squadrons. In addition to flying normal weather reconnaissance and combat support missions over Korea, the 56th Strategic Reconnaissance Squadron performed other required missions and joined forces with the 54th for typhoon reconnaissance.

Both squadrons are units of the Air Weather Service, a command of the Military Air Transport Service (MATS) which provides meteorological information to the U.S. Air Force and the Army Ground Forces around the world.



10,000 FOOT METHOD OF LOCATING TYPHOON AND LOW LEVEL BOXING SYSTEM

BOXING A TYPHOON—This drawing *(left)* shows flight path of WB-29 in process of locating and boxing a typhoon. Plane enters storm area at "A" where winds of 60 knots are observed. Course is altered here to keep wind always on left wing. Arrows at "B" denote 100-knot winds. Eye of storm is at "B." Once in the eye, dropsonde is released; heading is then taken to "C," where spiral descent is made from 10,000 feet to 1500 feet. At 1500 feet, plane proceeds to positions "D," "E," and "F." At "G" the mission is completed.



CONFIGURATION of the twin *Avon*-powered D.H. 110, day/night fighter, is shown in this photo

. . . from Western Europe

(*Continued from page 42*)

ably supplant on the production lines. Using the same fuselage as the *Ouragan*, the *Mystere* has a thin sweptwing which will allow the airframe to take advantage of turbojets of greater thrust which will be available by the time production of this airplane begins. Major Yeager's comments on flying the *Mystere* were that the fighter handled well and compared favorably in performance with the F-86 *Sabre*. The first prototype is powered by a 5,000-pound thrust *Nene* which will be replaced by more powerful jets in later prototypes. Nevertheless, this machine has been flown at 687 mph in level flight and a substantial improvement in performance can be expected when the Hispano-built *Tay* of 6,277 pounds thrust, or the ATAR 101C of 6,173 pounds thrust, is installed. Production machines will use one or other of these engines and, with either unit, top speed is expected to exceed 700 mph at sea level.

All-weather variants of the *Mystere* which are about to fly are the *Aladin* and *Harmattan*, single- and two-seater fighters respectively. These machines have the nose intake replaced by side intakes in order to accommodate interception radar.

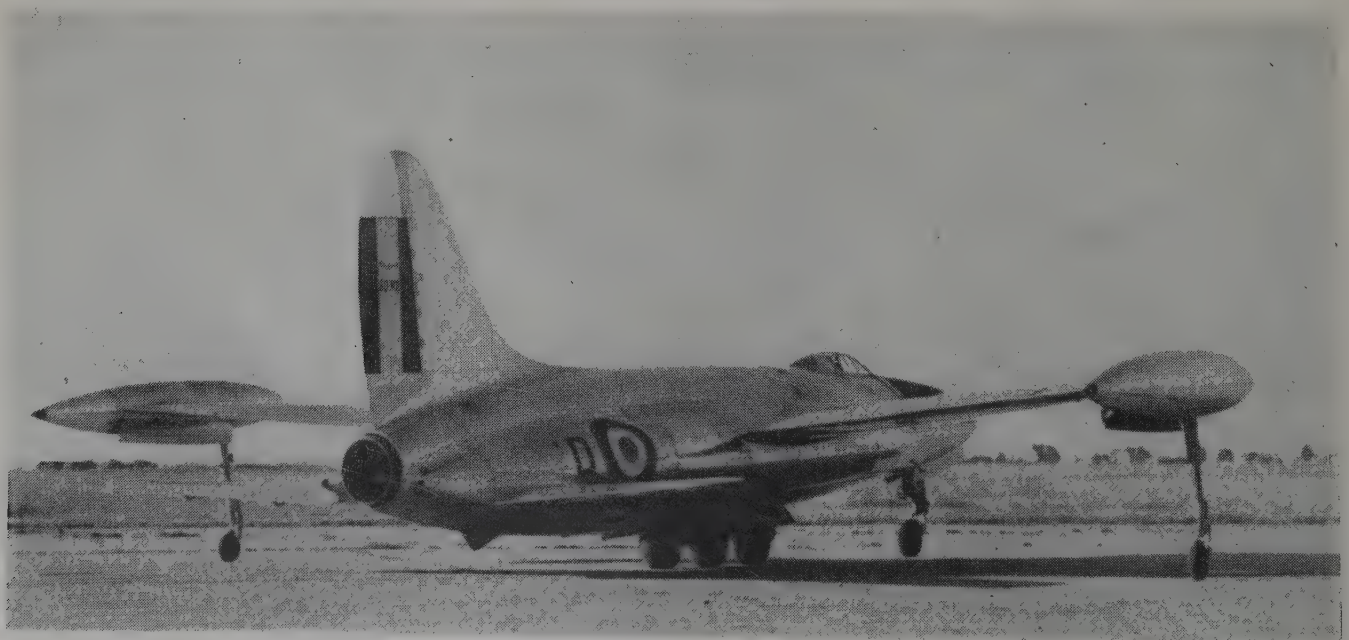
During the opening stages of the Hitler War, the names of the *Hurricane* and *Spitfire* could be relied upon to provide the British with encouragement and provoke profound respect from their antagonists. It is likely that their lineal descendants, the Supermarine *Swift* and the Hawker P.1067 (the latter unnamed at the time of writing but possibly to be known as the *Hunter*) will show as notable an advance over anything a potential enemy can put into the air as did their ancestors. Both the *Swift* and P.1067 are in their early production stages for the RAF and both possess limiting Mach numbers in excess of 1.0. They are the outcome of a line of postwar prototypes in which steady progress has been made. They were ordered "off the drawing board" for quantity production, and each has a single Rolls-Royce *Avon* turbojet rated at upwards of 7,000 pounds thrust. In deference to security we can say little concerning the details of these fighters, and although no official pronouncement on the built-in armament of these fighters has been made, reliable reports indicate that this will consist of four 30-mm guns.

Various other specialized single-seat interceptors of less orthodox design are in the very early constructional and development stages. The S.N.C.A. du Sud-Ouest is developing the supersonic SO 9000; Rene Leduc is developing a ramjet-powered supersonic fighter, and Macel Dassault is developing a delta-wing interceptor. British trends in interceptor fighter design may be portrayed by the experimental Fairey F.D.1 delta-wing research airplane which, according to the manufacturers, is designed for "*important research with revolutionary possibilities in the design and operation of fighters;*" generally interpreted to mean that the F.D.1 is a turbine-powered prototype for a vertically launched, rocket-powered "target defense" intercepter along the lines of the Bachem Natter.

The Fairey F.D.1 flew for the first time last year and has, for the initial trials at least, a 3500-pound thrust *Derwent* jet, a small tailplane, wingtip slots and parachutes. Presumably, the appendages will be progressively removed as trials advance. It is interesting to note that the F.D.1 is the smallest British jet to have flown, spanning only 19 feet 6 inches.

It is not only the French that are evincing interest in the built-in rocket motor for

SUD OUEST SO-M2 is an experimental research airplane powered by *Derwent* turbojet. Rockets may be added to give additional thrust



boosting fighter combat performance, for the British are testing the Hawker P.1072 which is, in actual fact, a flying test-bed for the new Armstrong Siddeley *Snarler* bi-fuel rocket motor which is mounted in the rear fuselage and is fed from a tank behind the pilot with liquid oxygen and water/methanol. The P.1072 carries sufficient fuel to operate the rocket at full thrust for three minutes. At sea level this thrust is 2,000 pounds, but this increases to 112 per cent of that figure at 50,000 feet where the thrust of the main powerplant, a Rolls-Royce *Nene*, is rapidly falling off.

The First of the Specialized "All-weather" Fighters

Until last year, the West European airplane industries had produced no heavy fighters designed specifically for all-weather and night operation and capable of matching the tactical effectiveness of such airplanes as the USAF's F-89 *Scorpion*. However, some promising prototypes made their debut in 1951 and some of these can be expected to be operational by 1956.

But the Russians are most likely to use their TU-4 piston-engined medium-heavy bombers at night for, as the USAF has found in Korea, the operation by day of formations of bombers in the B-50 class has now become extremely hazardous in view of developments in day fighter defense. Thus, West European air forces cannot wait some four years in order to build-up a night fighter defense, and various two-seat conversions of existing single-seat fighters are now rolling off the assembly lines.

Such interim conversions include the *Meteor* N.F.11, an adaptation of the single-seat Gloster *Meteor* F.8 by Armstrong Whitworth Aircraft which is already in service with the RAF and Belgian squadrons, the de Havilland *Vampire* N.F.10 and the *Venom* N.F.2 which adhere to the original *Mosquito* side-by-side seating arrangements for pilot and radar observer. The *Vampire* night fighter was originally earmarked for export to foreign air forces, many of them not Atlantic Pact signatories, but the policy of supplying jet fighters to foreign air forces not sharing in Western defense when the Royal Air Force lacked modern equipment, has always been of dubious wisdom and it would appear that the exigencies of the times have at last driven home the folly of this policy.

The *Venom* N.F.2 is to be built in France by the S.N.C.A. du Sud-Est which is also developing the ungainly looking *Grognard*, the third prototype of which, the SE 2421, will be an all-weather and night fighter. Two prototypes of the *Grognard* are at present flying, the SE 2410 and SE 2415, and these are powered by two Hispano-built *Nene* turbojets staggered one above the other in the fuselage and having a common air intake above and behind the cabin. The first prototypes differ in that the SE 2415 has a longer nose seating a crew of two and sharper wing sweep. The all-weather version will have a top speed of 596 mph, but performance will be increased by the installation of two 6,277-pound thrust *Tay* units in place of the present *Nenes*.

The Italian Fiat company is at present completing an all-weather version of the G.80 two-seat jet trainer. The G.80 trainer is powered by a 3500-pound thrust De Havilland *Goblin* 35 and has a top speed of 550 mph, but the all-weather fighter variant will be powered by a 5,000-pound thrust *Ghost* and will carry nose-mounted radar and heavy armament.

The first of Britain's specialized all-weather fighters are the de Havilland D.H. 110 and the Gloster G.A.5, two interesting variations on a theme. The D.H.110 which, if chosen for production will be known as the *Vixen*, follows the twin-boom layout of earlier de Havilland fighters and is powered by two 7,000-plus pounds thrust Rolls-Royce *Avon* axial-flow units mounted side-by-side in the rear of the central fuselage. The crew of two is seated side-by-side in vertically staggered seats, the pilot being seated under a canopy offset to port, while the radar-observer is "buried" in the fuselage to starboard of the pilot.

(*Continued on page 50*)

GLOSTER METEOR 8's, ready for delivery, are lined up outside Fokker plant at Schipol

Watchers to the West

(*Continued from page 44*)

the fuselage, are made for easy maintenance. Mechanics can obtain ready access by removing the cowlings, then swinging the engines out and down to get at both sides. They don't have to tear the plane apart to service the engines, nor do they have to disconnect the controls or wiring.

The fuel system of the F-89 is so constructed and adjusted that it will drain the integral wingtip tanks and 12 bladder-type wing cells automatically, switching by itself from one to the next, and finally to the two self-sealing fuselage tanks.

There are two complete hydraulic systems to manipulate the *Scorpion's* controls, including dual actuators for all control surfaces.

The retractable tricycle landing gear is equipped with extra high pressure tires, which are extremely thin and enable the wheels to be completely swallowed up into the wing and covered by doors, thus giving the plane clean aerodynamic lines in flight.

So far that last step in the air defense mission—destruction—hasn't been necessary. But nobody in the WADF will predict when it might be. That's why, every time a pilot takes the air, he flies a "hot-gun ship." He is loaded for bear.

A good many intercept missions flown by Western Air Defense Force are occasioned by civilian airliners off course more than 20 miles or more than five minutes off schedule. The airline pilots are told to coddle their passengers. If they can get smoother air flying around a storm, they usually will. But since the detour constitutes a diversion from their flight plan, one of the air defense boys probably will be right up there beside them.

Some day, it might not be the United Mainliner from Honolulu or the TWA noon flight from Chicago. It just might be a man named Ivan, and his cargo just might make a mushroom-shaped cloud.

Private pilots, too, have had a chance to test the efficiency of the air defense. Regulations require them to file flight plans if they intend to fly more than 4,000 feet above the immediate terrain or to fly at any altitude more than 20 miles out to sea. Through close teamwork, the flight plans are communicated (communications again) to the WADF, and as long as the pilot flies his planned course, he's recognized as friendly. When he varies from it by 20 miles or five minutes—he probably will look over his shoulder right down the barrels of some loaded 20-mms.

AIRCRAFT PLOTTERS working at a filter center establish lines of flight from plane reports

The organization of the Western Air Defense Force is a masterpiece of decentralization and overlapping control. Headquarters are at Hamilton AFB, and from there the command channels stretch north to the Canadian border, south to Mexico and east of the mile-high city of Denver to roughly the 103rd meridian.

Geographically, the area is divided into air division (defense) districts. Thus, the 34th Air Division (defense) has its headquarters at Kirtland AFB, New Mexico, and working around, there are:

Twenty-seventh Air Div (Def) at Norton AFB, in Southern California, with the 1st Fighter-Interceptor Wing sharing the base; 28th Air Div (Def) headquarters at Hamilton AFB, along with the 78th F-I Wing; 25th Air Div (Def) and the 325th F-I Wg at McChord AFB, near Tacoma, Washington; and the 29th Air Div (Def) at Great Falls AFB, Montana, with the 101st F-I Wing at Larson AFB, near Moses Lake, Washington.

The air divisions do not have administrative control of the fighter-interceptors outfits, but they do have operational control. The air divisions consist of the aircraft control and warning units—the radar watchers—and the control centers which direct interceptor pilots to the target. The air divisions correlate all information on flights, including flight plans; they track unidentified flights from information received from the radar stations and the civilian filter centers, and then direct the fighter planes to do something, if the flights are not readily identified.

When Pearl Harbor occurred, the San Francisco area—as an example—was protected by two companies of regular infantry, 1400 Home Guardsmen and some useless coast artillery. The 20th Pursuit Group, stationed at Hamilton, was on maneuvers in Carolina, so there were no planes at all except the few that the Navy could muster from Alameda—13 air reserve trainers.

If the Japanese had decided to strike the Hunters Point Navy base instead of the one at Pearl Harbor, there was nothing in the world that could have stopped them.

That story isn't the same today. One Pearl Harbor is enough. The Western Air Defense Force intends to see that there will never be another.

About the only way there could be a Pearl Harbor-like surprise today would be through guided missile.

"Naturally," General Parker said, "we are concerned about missiles. But we don't feel that the prime danger today is from guided missiles."

He indicated that today the Air Defense Command believes any potential enemy would have to strike with conventional bombers. Missiles are something to worry about in the future.

And air defense, he emphasized, is a "now" proposition. The future will be met when it arrives, but air defense, meantime, has to be ready today. And it is.

WADF PILOTS relax in the ready room while waiting for klaxon to signal them into the air

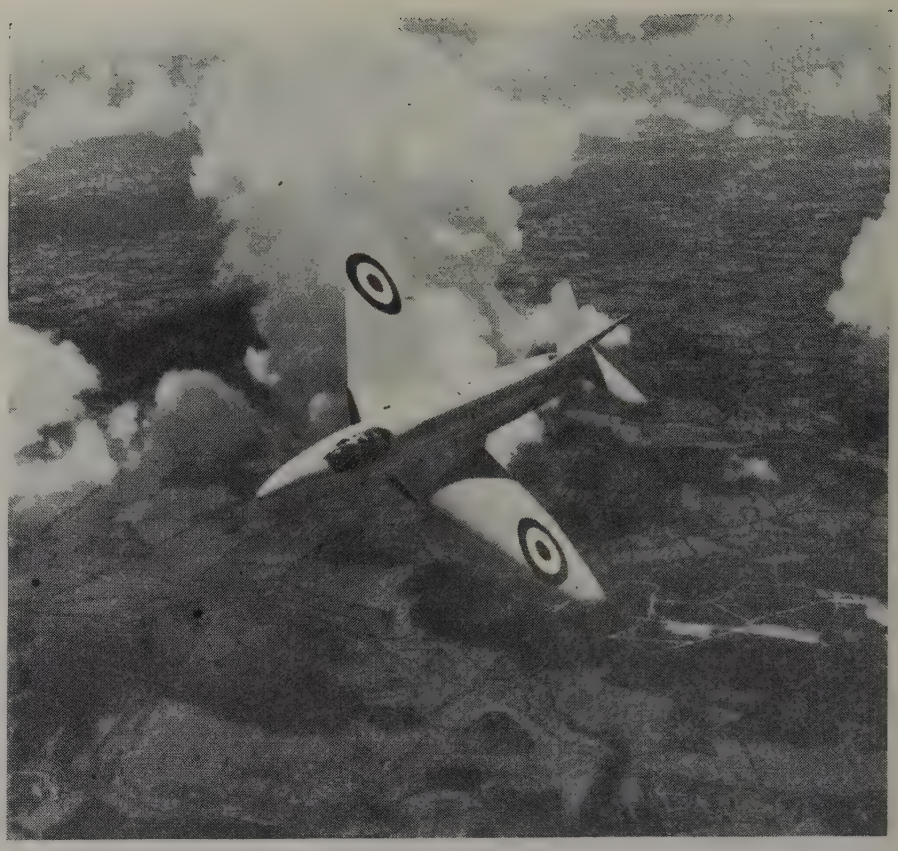
. . . from Western Europe

(*Continued from page 47*)

Destined for competitive trials with the D.H.110 is the G.A.5—reputedly to be known as the *Spearhead*—which is the world's first twin-engined delta and is powered by two *Sapphire* (J-65) jets of 7,000 to 8,000 pounds thrust each. The delta planform offers many advantages for fighters, although a serious drawback, admittedly one that has yet to be proved, is that the controls would not be powerful enough to ensure recovery from a fully developed spin, and the provision of a tailplane would seem to be the only effective way of dealing with this problem. In this connection, it is interesting to note that the G.A.5 *is* fitted with a tailplane which surmounts a disproportionately large vertical surface. The French S.N.C.A. du Sud-Est is working along similar lines to the Gloster company and is building a delta-wing all-weather fighter similarly powered and similar in outline to the G.A.5.

Naval Jet Fighters

West European naval air arms have been slow to introduce jet fighters into squadron service, but numerous shipboard jets are under development for the interception role. The French have been testing two prototypes for some time past, the Arsenal VG90 and the Nord 2200, the former designed by the Arsenal de l'Aeronautique and the latter by the S.N.C.A. du Nord. Neither one of these machines is, however, likely to be placed in production as the French Navy is already committed to a deck-landing version of the de Havilland *Venom* to be built at Marignane.



FLIGHT PHOTO of the Hawker P 1067 shows the sharp angle of sweepback to its wings and tail surface. A fighter-interceptor, the P 1067 is powered by an *Avon* jet engine

The first prototype of the VG90 was destroyed during early trial flights in 1949, but a second machine is now under test at Melun Villaroche. Powered by a *Nene*, the VG90 is unusual in having its 25° sweptwings mounted in shoulder position. An armament of three 30-mm guns is called for by the specification which also produced the similarly powered and armed Nord 2200 which also crashed during initial trial flights in 1949. The Nord 2200 has since been rebuilt and has joined the VG90 at Melun Villaroche.

Three jet fighters are in production for British Naval Aviation, a deck-landing version of the two-seat De Havilland *Venom* known as the *Sea Venom* N.F.20, and the single-seat Hawker *Sea Hawk* F.1 and Supermarine *Attacker* F.1.

The *Sea Hawk* and *Attacker* are both Rolls-Royce *Nene*-powered, the former having a top speed of around 610 mph at sea level and the latter 590 mph. The *Sea Hawk* has a particularly good range due to the adoption of wing trailing edge exhaust ducts which leave the rear fuselage clear for fuel tanks. A swept-wing version, which was at one time to be known as the *Sea Hawk* F.3, has been undergoing carrier trials but is unlikely to be produced in quantity. Further experience with deck-landing airplanes fitted with swept-wings will be acquired with a number of *Swift* F.1 fighters that are to be built for the Royal Navy. The Supermarine *Attacker* is the first jet fighter to be used by the British Navy as an operational airplane, and the first squadron to be equipped with these fighters recently embarked on the new aircraft carrier *HMS Eagle*. The *Attacker* is unusual in having a tailwheel undercarriage.

Claimed to be the most powerful shipborne airplane in the world is the Supermarine Type 508 which is only experimental at the present time. Unlike other fighters now used by the Royal Navy, the Type 508 was designed from the outset for Naval use and is, therefore, no compromise between conflicting naval and land-based fighter requirements.

The prototype departs from modern trends in having straight wings, but the total thrust of some 14,000-plus pounds available from its two Rolls-Royce *Avon* jets can be expected to push the "508" along at speeds well towards the high airframe limiting Mach number. Its most original feature is its butterfly tail; a system not hitherto seen on a fast or aerobatic airplane. This tail assembly with its "yaw-pitch" controls may seem surprising in view of the critical importance of the tail in the transonic zone, but it may well give an increased strength factor in the problem of allowing sufficient clearance for the jet stream. Rumors suggest that production derivatives of this prototype will have sweptwings and a more orthodox tail assembly.

Although tremendous expenditures cannot buy back lost time, Western Europe is certainly making a concerted effort to provide a strong air defense. However, weakness is frequently regarded as an invitation by an unscrupulous aggressor and, today, time cannot be numbered among the allies of the West.

New Phonetics to Note

Pilots, hang out the black crepe for Roger, Dodger, that old codger! Roger Dodger . . . or just plain Roger, for short . . . has been a well-known fellow in aviation circles since the addition of the "wireless" to airplanes. Roger is the phonetic word for the letter "R" and also means "received your message okay." But Roger is about to go by the boards. Another one of those international agreements has banished dear ole Roger . . . and in his places comes . . . Romeo! If you've been concentrating on Able, Baker, Charley, forget it and take up Alfa, Bravo, Coca . . . and Bravo to you, too. Here's the complete new phonetic alphabet that everyone expects to become quite official sometime next Fall or Winter.

	Old	New		Old	New
A	Able	Alfa	N	Nan	Nectar
B	Baker	Bravo	O	Oboe	Oscar
C	Charlie	Coca	P	Peter	Papa
D	Dog	Delta	Q	Queen	Quebec
E	Easy	Echo	R	Roger	Romeo
F	Fox	Foxtrot	S	Sugar	Sierra
G	George	Golf	T	Tare	Tango
H	How	Hotel	U	Uncle	Union
I	Item	India	V	Victor	Victor
J	Jig	Juliet	W	William	Whiskey
K	King	Kilo	X	X-ray	Extra
L	Love	Lima	Y	Yoke	Yankee
M	Mike	Metro	Z	Zebra	Zulu

Roger, Roger . . . Wherefore art thou, Roger!

Engine Overhaul

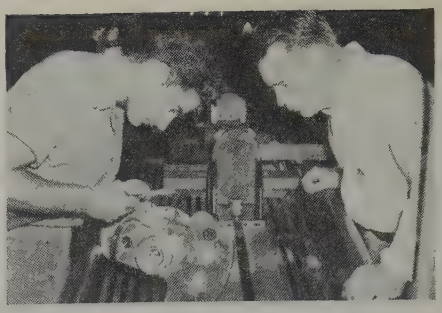
(*Continued from page 29*)

Tinkering? No! During the life of the engine, the most important things to watch are the danger signals—oil consumption, oil pressure, changes in fuel consumption, erratic accessory performance, etc. They mean trouble. In the course of every engine operation, the owner is sooner or later faced with the problem of the advisability of a "top-overhaul." In the first place this is a rather vague term and like the work itself it doesn't mean much. A "top-overhaul" means disassembly of an engine as far as the crankcase and overhauling as much of the engine as possible without further disassembly. In short "top-overhauls" are *not* recommended. There are exceptions to this, but they are rare. You'll find that the airlines sometimes will run an engine out through an overhaul period, after some part has failed and they have replaced it in a maintenance operation that might be called a "top-overhaul," but the airlines have had long experience to guide their decisions in such cases. For the executive operator, stay away from "top-overhauls".

All of which brings us to an interesting point—just when do you change an engine? This discussion will go on as long as pilots hangar-fly. There are a few important facts which should be introduced into the discussion if it is to be completely objective. First, you'll hear the airline people say they run their engines over 1,000 hours between overhauls and "you executive boys" yank an engine at 700 or 800 hours. You must understand that there are two kinds of time that you can put on an engine; the first is running or flight time and the second which is almost as bad is *sitting* time. Don't forget that an airline puts over 1,000 hours on their ships in three to five months, while it takes about a year and a half or two years for the average executive's airplane to log the same amount of time. This sitting time is bad! The seals dry out, vital parts can rust (it only takes a couple of weeks in a damp hangar to ruin an otherwise good engine), and countless other things can go wrong as a result of *not* flying. So when you are planning your overhaul cycle, look at your calendar as well as your log books.

What's the rule about engine changes? There is none. But, if the engines are running okay, if the oil consumption and fuel consumption are normal, if there are no bad leaks, if the accessories check out okay, if the compression is okay, *keep* the engines in the airplane up to the factory recommended hours of operation.

Unfortunately, engines only run as well as the accessories will let them or help them run. Executive aircraft operators should be alerted to the fact that right now delivery on accessories is very bad (due to the shortage of some component parts) and it is a good idea to keep a spare set of accessories in stock. Like many other things in the aviation business, this too has its drawbacks. It is imperative that the accessories be inspected thoroughly before their use. Fuel pumps that have been in storage for more than four months should have their seals checked. The diaphragms in carburetors should be inspected if they have been in stock for more than six months. If they have been in storage for a year of more, the entire unit should be flow benched.



P&W factory representative checks a magnaflux operation at Airwork overhaul base

Another common question often asked is: Should the owner of a twin-engine airplane have one or two spare engines? That one is easy to answer. He should have *two*. The most important factor in executive aircraft operation is the availability of the airplane. This is one way that we are able to judge the value of the airplane to the owner. It just doesn't make any sense to have a machine that belongs in the air "tied" to the ground for 30 to 45 days while the engines are removed, majored, and replaced. Fixed expenses go on and with spare engines the owner unnecessarily loses about 10 per cent of the annual availability of the airplane. As Al Smith said, "Let's look at the arithmetic:" the cost of a spare pair of engines for a DC-3 is less than 3 per cent of the total cost of the airplane! For a Twin-Beech it's only about 4½ per cent of the cost of a new airplane complete. So those two spare engines are a pretty cheap way to get 10 per cent more utility from the airplane.

The reserve for overhaul is the smallest major item of aircraft operating expense. Compare it with the cost of insurance, depreciation, airframe maintenance, pilot salaries or the bill for gas and oil. Those engines that everyone finds so easy to condemn are pretty good friends after all; and they don't cost as much to keep going as you think. After all, those engines supply the power in Air Power. They are built strong and are reliable. You can keep them strong by being as reliable in your care of them.

Conversion: B-25

(*Continued from page 31*)

ly effective lighting of the instrument panel was achieved through the placing of 38 small bulbs, alternately red and white, across the panel's top, beneath the tubular shield. Selection of color, blending of colors, and intensity control is made by the pilot rheostatically. The SAC shop radium-painted flight instruments (arranged down the panel's sides) orange, and engine instruments (down the center) green. The panel was painted with gray-green crackle and, for better distribution, rides on 30 #4 shock mounts, instead of on the 12 #8 mounts which previously held it.

Warning light and electrical switches formerly were scattered in varying positions about the cockpit. When Southwest Airmotive rebuilt the plane, they were brought together for more efficient and convenient operation in an electrical sub-panel beneath the main instrument panel on the pilot's side. On the bottom row are circuit breakers; center row, warning lights and, top row, switches (also the control for the aft heater fire bottle).

To make more room on the main panel, Southwest Airmotive moved hydraulic and fuel gages onto a sub-panel located beneath the main one on the co-pilot's side. Also located here is the altitude limit switch. To permit the installation of this shock-mounted sub-panel, vent controls were moved to its left.

Now located within easy reach behind the co-pilot's seat is a new generator control panel, together with switches and circuit breakers.

The SAC electrical department alone made the following additions and changes: 100,000 BTU Janitrol heater installed in the tail for the cabin (another, a 50,000 BTU Janitrol, serves the cockpit); expansion of the fire extinguishing system to include three electrically operated bottles (one in the tail for the heater, one for each engine), and two manually operated bottles (one for each engine); fuel flow system; ice lights; changes

INSPECTORS make permanent record of the condition of every engine part processed. In overhaul, engines are completely torn down and every part gone over carefully for flaw, break

in cabin and cockpit lighting; panel lighting; fuel and oil pressure warning; carburetor anti-icers; prop anti-icer capacity doubled; constant source with restricter valve for windshield anti-icing; two fuel tranfer pumps; fire warning for new heater; pitot tubes and heaters; taxi and passing lights; no-smoking and seat-belt lights; and automatic lighting and door warning for rear baggage compartment.

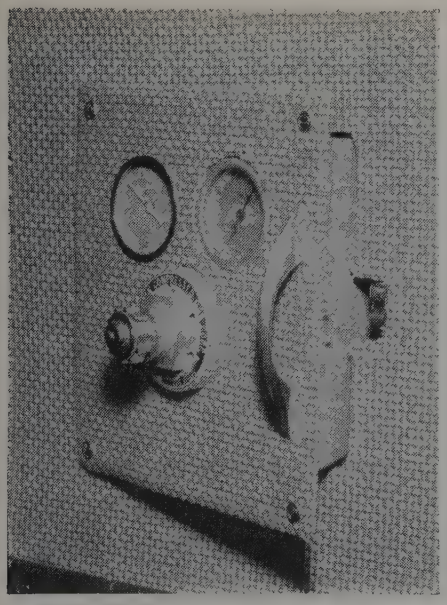
There are two divisions to the passenger cabin of the Trostel B-25, joined by a crawlway. In the main cabin aft of the crawlway are two full-swivel chairs and a double seat, custom-built by Burns and, like the upper half of the sidewalls, upholstered in Goodall tan basket-weave wool. Trostel is a world-reknowned tannery so, naturally enough, the lower half of the sidewalls is in quilted burgundy-red baseball glove leather by Trostel. Cabin headliner is Bridgeport gray-tan broadcloth, and the carpeting is in rose-tan wool. Curtains are an attractive blend of these various colors.

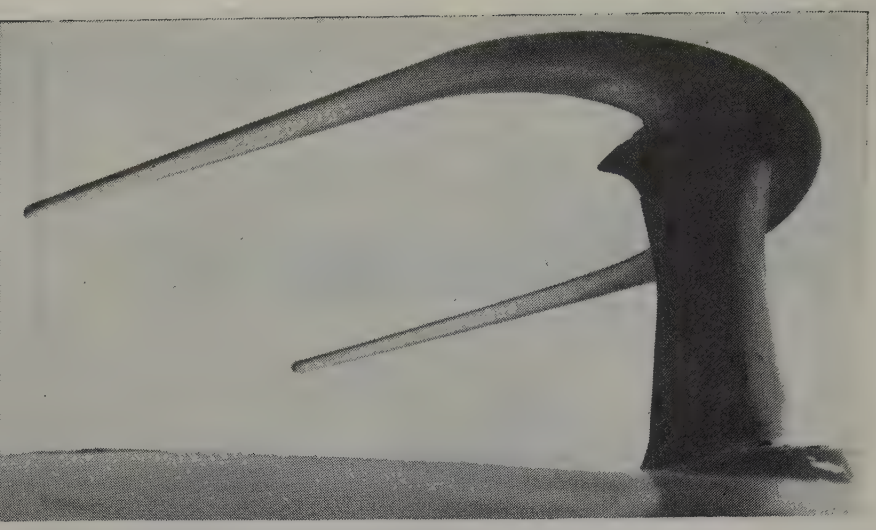
In the other passenger cabin, forward of the crawlway, are seats for four persons, in groups of two facing each other. The decorative motif is identical with that in the aft part of the aircraft.

Semi-circular, leather-upholstered storage bins are built in at the corners of the crawlway, and the floor of the crawlway is "carpeted" by a four-inch foam rubber mattress on which four extra passengers could ride, facing center and using safety belts installed there for them. To make this crawlway arrangement possible, Southwest Airmotive removed hydraulic tanks formerly situated there. The bomb bay beneath is now a baggage compartment, and is also the location of an auxiliary engine starting power unit.

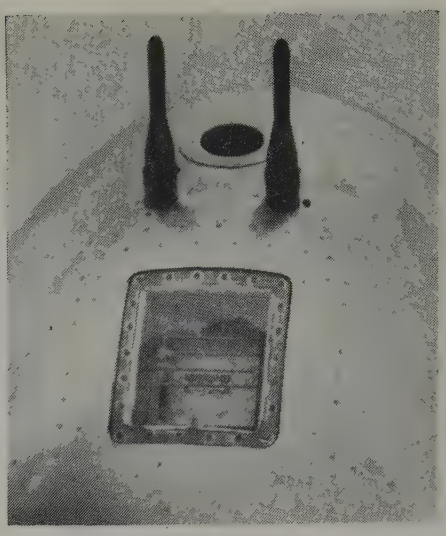
The Trostel B-25 is, indeed, one of the finest airplanes in America's executive fleet. Piloted by Tom Neyland and P. N. Bales, and based in Milwaukee, this B-25 is a flying acknowledgement of the conversion powers of Southwest Airmotive and the progressive thinking and success of the Albert Trostel Company.

PRESSURE regulator panel for oxygen system is hinged for easy accessibility to lines





Picture 1.



Picture 2.

AIRPLANE ANTENNAE QUIZ

Picture 4.

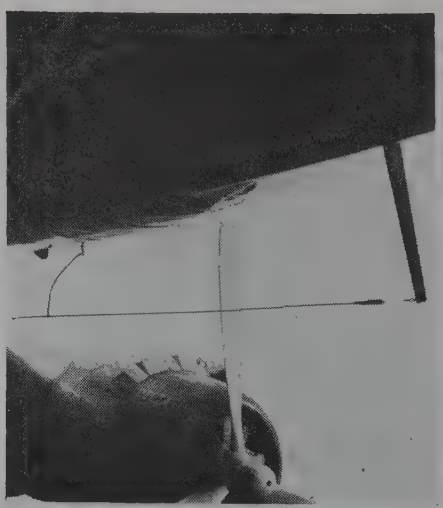
By KEITH L. GIMSON

First Officer, Delta Air Lines

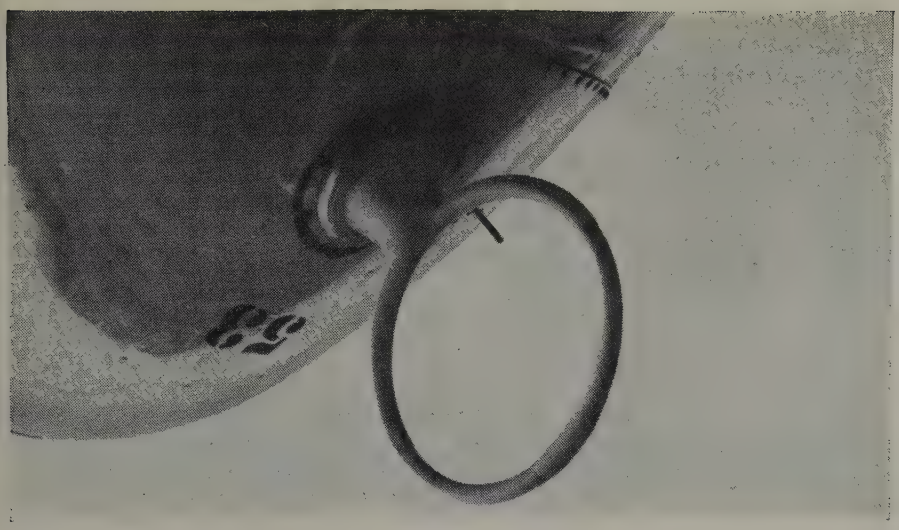
The commercial airliner of today has more antennae than a New York City apartment building. For example, a DC-6 carries two ADF units, one or two Omni receivers, one ILS, one fan marker receiver, 20 channel VHF two way, and 10 channel HF two way. Some of these radio units require more than one antenna. Pictured here are 10 of the most common. Can you name them? Give yourself 10 points for each correct answer. If you get 90 or 100, rate yourself as a radio expert; 70 to 80 puts you in the airline pilot class; 50 or 60 makes you a commercial pilot; 30 or 40 a private pilot. If you get below 30, don't admit it.

Picture 5.

Picture 6.



Picture 7.



Picture 3.

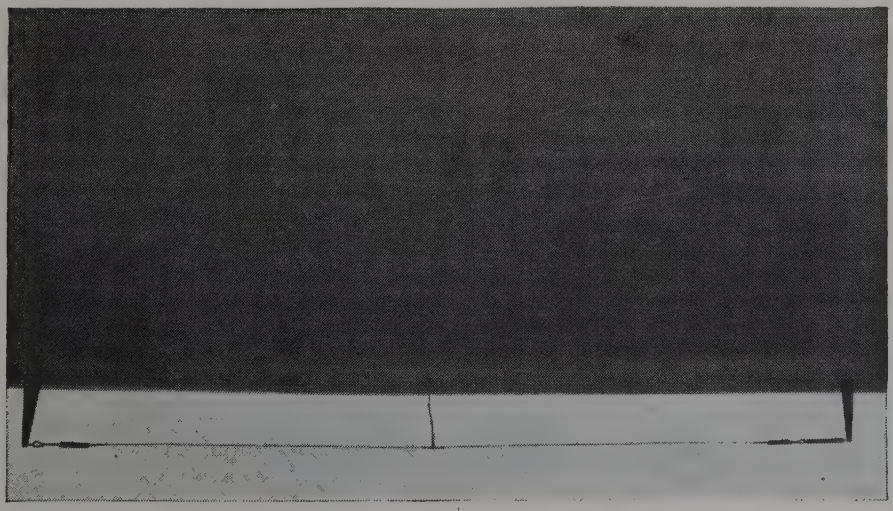
Questions #1 and #2 (Picture #1): This horseshoe-shaped antenna picks up the signals from three different types of transmitters. Name two of these. *Question #3* (Picture #2): This small antenna in the nose, just below pitot tubes, has one special use. *Question #4* (Picture #3): Loop antenna shown here is generally used with what receiver? *Question #5* (Picture #4): Longest antenna on plane runs from nose to tail. which radio uses it? *Question #6* (Picture #5) What are those tear-drop shaped antennae? *Question #7* (Picture #5): What does short stub of an antenna between two tear drops serve? *Question #8* (Picture #6) Which radio uses two of these antennae (usually) that are about 20 feet long? *Question # 9* (Picture #7) Where you see one of these, you'll find another like it. What are their use? *Question # 10* (Picture #8) This antenna is about seven feet long (its length is important). What special radio does it operate?

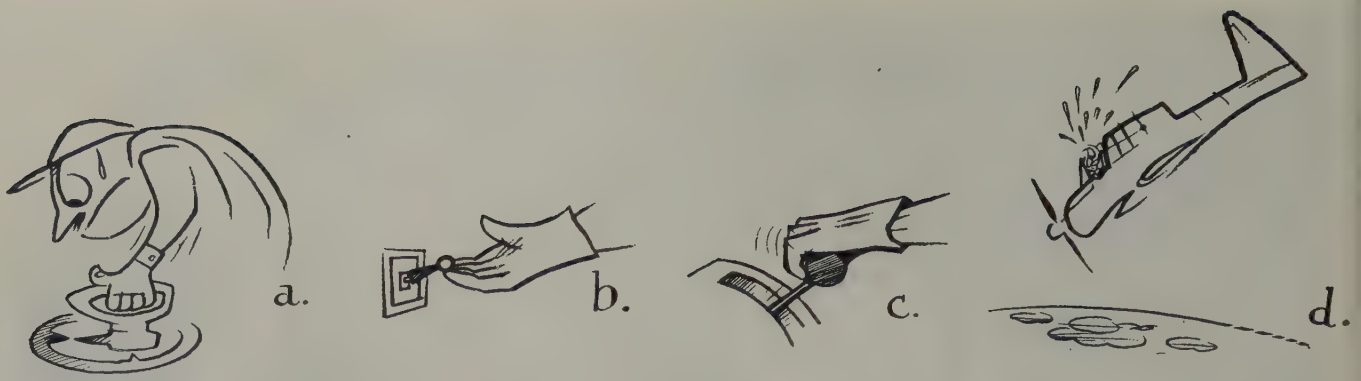
CHOICE OF ANSWERS

1. High Frequency long-range two-way (HF)
2. Very High Frequency two-way (VHF)
3. Low Frequency receiver
4. Radio compass loop (ADF)
5. Radio compass antenna (ADF)
6. Localizer of ILS
7. Omnirange receiver
8. Visual Aural Range receiver (VAR)
9. Glide path of ILS
10. Fan Marker receiver
11. Radio altimeter

ANSWERS ⟶ *Question 1:* 6, 7 or 8; *Question 2:* 6, 7 or 8; *Question 3:* 9; *Question 4:* 3; *Question 5:* 1; *Question 6:* 4; *Question 7:* 2; *Question 8:* 5; *Question 9:* 11; *Question 10:* 10

Picture 8.





Dilbert

(*Continued from page 36*)

fuel pump, or use hand wobble pump.

c. Retard throttle to starting position.

d. Nose over into steep glide.

One other point—why in blazes did that goof lower his wheels for a landing in soft terrain. When in doubt on this point, land with your wheels up. The only time wheels should be lowered for a forced landing is when the landing area is so hard and smooth that a successful landing is certain, or where the terrain is so rugged (stumps, boulders, etc.) that shearing the landing gear will help deceleration. Of course, when faced with such rough terrain, you should bail out, if possible.

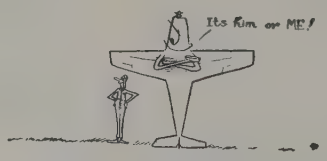
Search and Rescue—It is heart warming to see the all-out search and rescue efforts that are made whenever word is received that a plane is down or overdue.

This is the story of such an operation, or rather, about one small segment of it—a not too heart-warming segment, at that. You will understand when you learn that a certain impulsive, careless and negligent aviator was involved. Guess who! He wasn't the cause of the initial emergency, but he sure did increase it.

It all started one mid-afternoon when a cross-country pilot was four hours overdue. Dilbert and another volunteer pilot were paired off in lightplanes to cover a certain sector. At one point, Dilbert spotted what he thought might be an airplane down among the trees. So he went down and circled the

spot, examining everything intently. So intently, in fact, that he neglected to control his airplane. It whipped into a spin and crashed into the trees.

Dilbert may be the dumbest, but he wasn't the first and he won't be the last pilot to spin in due to loss of airspeed in a turn. The easiest way to do this is to become so engrossed in watching something on the ground that you forget to pay attention to your flying. It's the old story: if you don't fly your plane, it will take charge.

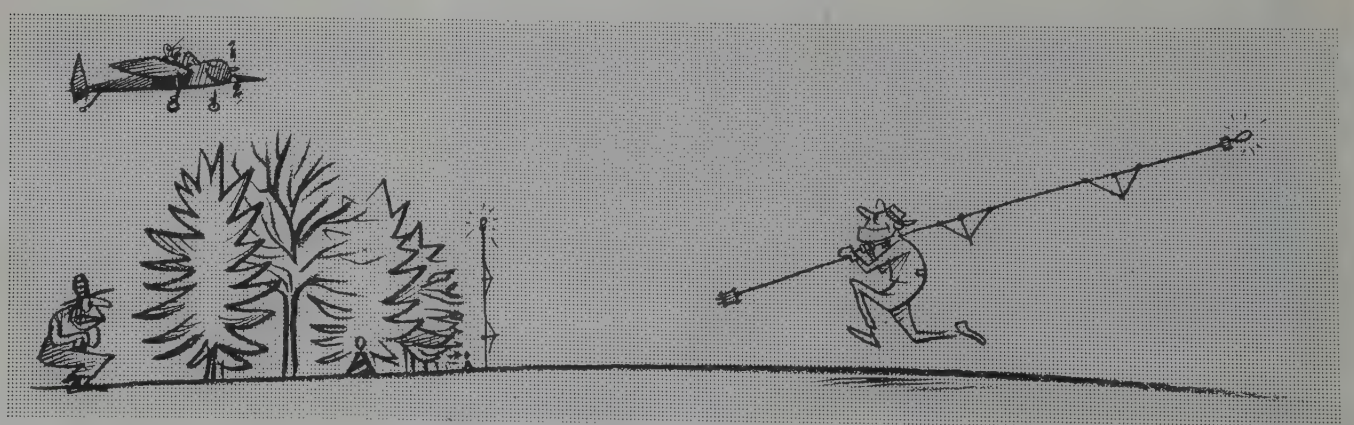


To ease your mind about Dilbert and to clear up the loose ends of this episode: Dilbert's wing man reported the crash. The trees had smothered his fall so he wasn't badly hurt, and he was picked up by helicopter about an hour later at the edge of the clearing. The cross-country pilot, by the way, had had a forced landing in an isolated area and reached a telephone to report in shortly after Dilbert's crash.

Clever work—Despite the fact that Russia will probably claim they did it first, here is the inside story of another little bit of American ingenuity.

Trees near the edge of a flying field at a certain training station presented a serious hazard during night flying. For some reason, it was impossible to have the trees cut down, and the installation of field lighting, except for runway lights, was still several months away. But night flying had to go on. What to do?

The station engineer came up with the answer. Following the advice about not hiding your light under a bushel, he built three portable, collapsible masts, 30 feet tall, and installed a red light on top of each. When the masts were placed inside the boundary fence, across the end of the runway, the tree hazard was whipped. You see, the masts were so spotted that as long as the student kept the red lights in view, he was in a glide path which would insure that he cleared the trees.



Parachute Pointers — Visited an outfit the other day that was having an epidemic of spilled parachutes. As a result of some expert sleuthing, the parachutes themselves were cleared of all blame. In each case the finger of guilt pointed to some Homo sapiens—you know, the Dilbert variety.

In two instances parachute riggers had allowed insufficient slack in the rip cord housing. The chutes were spilled when the pilots stood up to disembark at the end of a flight. All other spills were believed to have resulted from chutes being improperly carried or handled.

The upshot of the investigation was that the men of this outfit were quickly exposed to a course of parachute indoctrination. The indoctrinators insisted that when faced with a bail-out emergency the lowly parachute immediately became man's best friend. This being so, chutes were entitled to the utmost consideration. The boys were shown the only three ways to carry their parachutes.

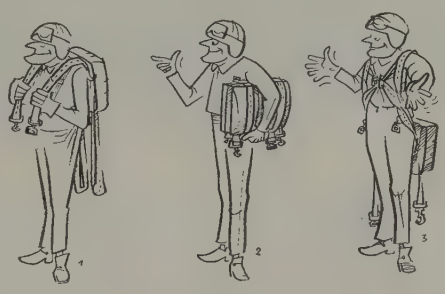
Since most other ways of carrying chutes are apt to lead to trouble, and since you too

might be interested in avoiding chute trouble, here are those three ways:

1. Carry the chute on your back with a leg strap over each shoulder, holding a strap in each hand.

2. Roll up chute and carry under one arm (leaves other arm free).

3. Wear the parachute with chest straps buckled and leg straps unfastened (leaves both hands free for talking sign language, or carrying other equipment).



Not All Wasted—Asked what he had done with his pay during his first liberty, an aviation cadet answered, "Part went for liquor, part for women, and the rest I spent foolishly."

SETH'S SAFETY QUIZ

1. What is the potential danger of an engine with excessively rich idle mixture?
2. What precaution should you take after an unusually hard landing?
3. Is it necessary to taxi at high rpm to avoid fouling your engine?

SAFETY QUIZ ANSWERS

1. Danger from loss of power during take-off due to spark plugs fouling and shorting out.

2. Be sure that a thorough inspection is made for structural damage before the plane is flown again.

3. No. To avoid engine fouling during taxiing, have proper idling mixture—and make periodic engine run-up.

PICTURE CREDITS

Page 8—Acme, Consolidated Vultee; 11—Acme; 12—Groenhoff; 13—Goodyear; 14, 15— USAF; 17—USAF; 18-27—Green, British Information, De Havilland; 28, 29—Airwork; 31—Southwest Airmotive; 32—AiResearch, Levy; 34—Levy; 35—Levy; 38—Acme, Green; 42—Green, Adams; 44, 45—USAF; 46—Levy; 47—Green, De Havilland; 48—USAF; 50—Hawker Siddeley; 51—CAA; 52—Airwork; 53—Collins; 54, 55—Gimson; 60—Bushnell Co.; 62—CAA; 64—Wilcox Electric.

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MCINTIRE ASSOCIATES, 505 North Ervay Dallas, Texas and Monterrey 101-410, Mexico City have domestic and foreign buyers for good used aircraft. No charge for forwarding complete details upon request.

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NEEDED IMMEDIATELY! AVIAIR needs immediate listings of all types of Cessna's. AVIAIR, 22 W. Madison St., Chicago, Illinois.

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AIRMART Aircraft, Aircraft Brokers, 1930 State, Chicago 16, Illinois have immediate buyers for all types of aircraft. Send complete details today.

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USED PLANES FOR SALE

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BONANZAS: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

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BONANZA A-35, 2-way radio, gyro panel, lites. 500 hrs. since major, many extras, $8,800.00. 18 months to pay. Airmart Aircraft, 1930 State, Chicago 16, Illinois.

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BEECHCRAFT C-18-S #48508S has Hydromatic propellers. 160 hour and 580 hours SOH engines. Excellent five passenger interior. June license. One zero time spare engine. One high time spare engine. Radio includes VHF,LF, ship to shore, ILS. Anti-icer and de-icers. Never used by armed services. Many spare parts. In the east. $43,000. Make offer. MCINTIRE ASSOCIATES, 505 North Ervay, Dallas, or Monterrey 101-410, Mexico City.

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CESSNA

170'S: 20 available. 1948, #415QVS, has 333 hours. Metal propeller. Primary blind. Radio. $3500. Also; 1949 all metal, #386GVS, with 221 engine hours. Metal propeller. Primary blind. Omni-range. Excellent. $5000. Consult, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere".

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EXECUTIVE TRANSPORT AIRCRAFT

FOR complete market report of available multi-engine aircraft, including Beech, Convair, Curtiss, Douglas, Grumman and Lockheed manufacture, write or call William C. Wold Associates, 516 Fifth Avenue, New York 18, N. Y. Telephone MUrray Hill 7-2050.

GRUMMAN

GOOSE AMPHIBIANS: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

LOCKHEED

LODESTARS. File 360. Seven airline planes available. Late model low time ships that are perfect for executive conversions. Can offer price quotations as is or converted to your specifications. Inquire MCINTIRE ASSOCIATES, 505 North Ervay, Dallas or Monterrey 101-410, Mexico City.

10A: #2241XS has under 150 hours since aircraft, propellers, and P&W R985 engines major overhauled. Fire control. Latest landing gear. Ten passenger reupholstered interior. Airline instruments and radio. Beautiful, bright, and clean throughout. Top condition. $28,000. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City. "Airplanes Everywhere".

12A: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

VENTURAS: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

NAVION

NAVIONS: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

SUPER 260'S: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

NAVION—'47 650 hrs. Engine '48—205 HP—250 hrs. Two tone brown leather. Altitude and directional gyros. Man. and cyl. temp. gauges. G.E.L.I. and A.R.C.—11 VHF. Aux. tanks. $650. Telephone 6996, Bradford, Pa.

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STINSON VOYAGERS and Station Wagons—#137, 1948 Stationwagon, 710 total, 30 hrs. SMOH, gyro panel, 2-way radio, $2,850. 18 months to pay. Airmart Aircraft, 1930 State, Chicago 16, Illinois.

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125'S: See POWERS & GEORGE display advertisement on page 43 of this issue. "Airplanes Everywhere".

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TAYLORCRAFT SPORTSMAN (new model 19) now available for immediate delivery. America's finest 2-place, side by side airplane. Extra big baggage compartment gives 4-place cargo utility. Lowest price including starter, generator, 12 volt system, etc. Ideal for CAP, farm business man, training. See your local airport operator or write today. TAYLORCRAFT, INC., Conway-Pittsburgh Airport, Conway, Penna.

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YOUR Leather Jacket renovated expertly. FREE circular. Berlew Mfg. Co., Dept. 33, Freeport, N. Y.

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HELMETS: ANH-15 AAF tan cloth, sponge rubber earcups $2.00. A-11 AAF kidskin leather sponge rubber earcups $3.45. Chamois helmet $1.00. Leather helmet with chin-cup $1.50. White cloth helmet $1.00. White flying cap 75c each. New. Flying Equipment Sales Co., 1641-5 W. Wolfram St., Dept. S, Chicago 13, Ill.

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TIRES 6:00 x 6, ribbed 4 ply. *General Tires* Brand New $16.00, tube $3.50. Flying Equipment Sales Co., 1641,5 W. Wolfram St., Dept. S, Chicago 13, Ill.

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NAVION OWNERS: CAA Approved Landing Gear Fairings complete with wheel covers. Ready to install $45.00. H. E. TENNES, 801 Burlington Ave., Downers Grove, Ill.

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STUDENTS, Mechanics, Flight Engineers: "Aero Mechanics Questionnaire" by Ralph Rice. A greatly enlarged and completely revised printed edition, 222 pages of multiple choice questions, answers and explanatory notes covering all phases of Aircraft and Engine Mechanics including Power Plants, Carburetion, Lubrication, Propellers, Electricity, Woodwork, Dope and Fabric, Sheet Metal, Welding, Rigging, Weight and Balance problems, Hydraulics and Civil Air Regulations based on current issues. $5.00 postpaid, or C.O.D. plus postage. Address: Paxon Publications, Box 479, Lawrence, Kansas.

AVIATION QUIZ BOOKS—The following outstanding books by Charles A. Zweng lead the field and prepare you for your rating. Included with each book are authentic examinations with new material not available elsewhere. Also included is a late Government Weather Map pertinent to the examination. Why take a chance? Zweng books include: Flight Instructor $3.50; Flight Engineer $4.00; Link Instructor $4.00; Private & Commercial Rating (with the new examinations) $3.50; Instrument Ratings $4.00; Meteorology for Airmen $3.00; Aircraft & Engine Mechanic including hydraulics, weight and balance $4.00; Parachute Technician Rating $3.00; Flight Dispatcher $4.00; Civil Air Regulations $1.00; Airport Operation and Management $4.50; Zweng Aviation Dictionary $6; Aeronautical Navigation $3; Practical Manual of the E6B computer $2.50; Ground Instructor Rating $4.00; Flight Instructor Oral Examination $1.00; Control Tower Operator, our Flight Dispatcher covers most of the control tower examinations, $4.00; Leading Airline Executives and Pilots owe their success to early training with Zweng texts. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif. (Free Catalog).

FLYING THE OMNIRANGE by Charles A. Zweng. New "first edition" fully illustrated, designed to aid the pilot in flying the new Omnirange Stations now being established by the C.A.A. Order new C.O.D. or postpaid. DeLuxe edition only $4.00. Important books on aviation by other authors include: Crop Dusting (set of 6 manuals) $12.00; DeLuxe large Airline Log books $6.50; other Logs $1.00 up; Air Officer's Guide $3.50; Jet Aircraft Power Systems $5.50; Stick Rudder $4.50; A Flier's World $3.75; Wright Brothers $5.00; Naval Officer's Guide $4.00; Electronic Navigation $4.50; Aircraft Carburetion $3.75; Long Range Flight $3.50; Air Navigation (Weems) $4.50; Air Transport Navigation $6.00; Meteorology with examinations $3.00; Conquest of Space $3.95; Helicopter Guide $2.00. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

C.A.A. RATINGS: Try up-to-date Ross Guaranteed Questionnaires to help you obtain your C.A.A. Ratings! Ross Questionnaires have been used by thousands of Pilots, Mechanics, and Instructors as they are the only source for current typical exams. Select your Ross Questionnaires from the list below. "Private Pilot $1.00"; "Commercial Pilot $4.00"; "Flight Instructor $4.00"; "Instrument Pilot $4.00"; "C.A.R. for Pilots 50c"; "Engine Mechanic $3.00"; "Aircraft Mechanic $3.00"; "Meteorology Instructors $2.50"; "Navigation Instructors $2.50"; "C. A.R. Instructors $2.50"; "Engine Instructors $2.50"; "Aircraft Instructors $2.50"; "Fundamentals of Instruction $1.50"; "Parachute Rigger $2.50"; "Control Tower Operator $2.50". As a special offer for Students and Schools, the Complete set of above Questionnaires may be purchased for $15.00. Don't Hesitate, order today. Remember! If you are not completely satisfied with any Ross Questionnaire your money will be refunded in full. Order direct from Ross Aero Publishers. Administration Bldg., Dept. 1-S, Commercial Airport, Tulsa, Oklahoma. Save Money, Time, and Effort.

CAA EXAMS MADE EASY. Air Navigation simplified. Guaranteed, thorough examination cram course—homestudy. $3.50. Prepaid. Air Institute, B-7, Adams, Mass.

MAGAZINES (Back Dated)—Foreign, Domestic—Arts. Books, booklets, subscriptions, etc. Catalog 10c (refunded). Cicerone's, 86-22 Northern Blvd., Jackson Heights, N. Y.

BULLET Raceplane. Homebuilt, speedy, economical, low-winged monoplane. Blueprints $2.00. Corbcraft, 81 Elmerston, Rochester 20, N. Y.

FREE Aviation Book Catalogue. Books listed from all major publishers including the Gov't Aero Publishers, Inc., 2162-S4, Sunset Blvd., Los Angeles 26, California.

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WILL SACRIFICE proved new portable electric drill press invention (patents pending) on trade for late Bellanca, or any late four place plane. Need plane in furtherance of a business. This invention is being held off the market due to shortage of materials. A good item to manufacture or resell on royalty after materials again become available. Ivan Hart, Tuscarora, Nevada.

HELP WANTED

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ALASKA—Last American Frontier. $1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation. List of firms hiring. How-When-Where to apply. Alaska Opportunist, P.O. Box 883-SS, Hollywood 28, California.

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CAA EXAMS. Our exams are brought up to date weekly and are based on the exact CAA questions and answers. Guaranteed results. Commercial $6.00; Instrument $5.00; Engine Mechanic $6.00; ATR $6.00; Flight Instructor $3.00; Aircraft Mechanic $5.00. Any individual subject $2.00. Acme Flying School, Meacham Field, Ft. Worth, Texas.

NAVIGATOR Rating Examinations included in New Aeronautical Navigation by Charles A. Zweng, $3.00; Fairchild Surplus. (Electrical Averager) Sextant $17.50: PILOTS supplement your training. Order "Ground Instructor" $4.00 and "Ground Instructors' Rating" $4.00: Examinations included. These books by "Zweng" prepare you for increased earning power. Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

(*Continued on page 60*)

CLASSIFIED ADVERTISING

(*Continued from page 59*)

INSTRUCTIONS (Continued)

HOME Study Courses on Aeronautical Drafting, Engineering and Design. Write for free descriptive folder. Aero Technical Institute, 2162-S4 Sunset Blvd., Los Angeles 26, Calif.

INSTRUMENTS

NAVIGATION INSTRUMENTS: Beautiful new and reconditioned precision instruments. Brand new Link Aircraft Sextants with case $37.50; Fairchild averaging type $17.50; Bausch & Lomb Sextants, excellent condition $49.75; Hamilton 24 hour Master Navigation Watches $65.00; Pioneer Panel Compass (new) $17.50; Dalton Model "G" Computer (new) $7.50; Weems Mark II Plotter $2.00; Dalton E-6B Computer $10.00; A-2 Deluxe Computer with case $3.00; American Airlines Computer $5.00; New Dalton E-10 computer (metal) includes scale for pressure pattern flying $24.00; Astro Compasses (new) $12.50; (Free Catalog). Pan American Navigation Service, 12021-22 Ventura Blvd., N. Hollywood, Calif.

E-6B COMPUTERS, like new, $4.95 with leather cases $5.45 ($10.00 value). Sextants, like new, Ansco A-10, A-10A or Bausch & Lomb A-8A $16.85 with carrying cases. Money refunded if not satisfied. Kane Aero Equipment Co., 2308 N. E. 23rd St., Oklahoma City, Okla.

MISCELLANEOUS

AIRPLANE Buyers and Sellers! Deal direct and save time and money. We have every type of airplane listed at prices hundreds of dollars less than those asked by brokers, because there are no commissions or middlemen's fees to pay. We tell you who own the airplanes you are looking for, you contact the owner, and make your own deal. That's all there is to it. Seller's only fee is $5.00 to list an airplane (include a description up to 40 words). Send $1.00 and you receive listings of aircraft for sale. Save hundreds of dollars, Write today! Aircraft Listing Bureau, 1907 Archer, Chicago, Illinois.

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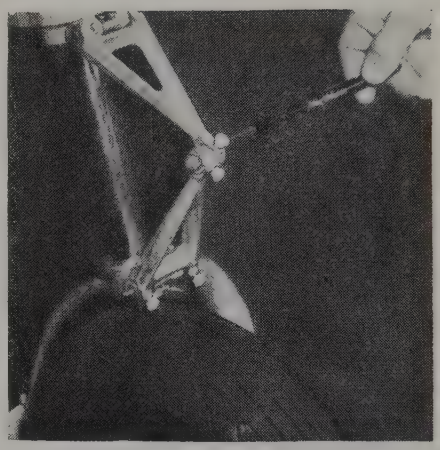
HELICOPTERS, Blueprints, Construction Kits, flying models. Catalog $1.00. Refunded with first order. AERO-TECH, 601 Jefferson Street, Montgomery, Alabama.

AIRPORT operators send today for TAYLORCRAFT, dealership information. Get in early on big expansion program. TAYLORCRAFT, INC., Conway-Pittsburgh Airport, Conway, Penna.

LEARN TO FLY and get paid for learning. Read advertisement under BOOKS classification, AIR INSTITUTE.

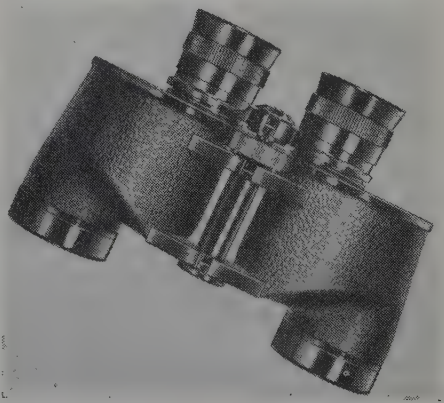
NEW AERO PRODUCTS

FLIGHT BAG #200 is a two-unit travel case designed for airline and private pilots. Made of top grain leather in shades of Suntan or Ginger, the Flight Bag consists of 1) a portfolio with individual pockets for maps, charts, etc., and 2) a regular traveling bag for clothes and toilet articles. Units can be carried as one or separately. Flight Bag has steel frame, metal bottom studs. Costs $39.00 (including tax), from Allied Brief Case, 186 5th Ave., N. Y.



PRO-KAP is a plastic cap which snaps onto any grease fitting to prevent dirt from damaging bearings. These plastic caps will reduce wear and save time and money during greasing by eliminating need of wiping off nipples before applying grease. They snap on securely, but are easily removed, can be used over again. Caps come in three colors (red, white and blue), three sizes. Designated C-101, they cost $1 for 20, from Van Dusen Aircraft Supplies, Teterboro, N. J.

SAFIR B-57 Resistor Spark Plug helps to eliminate radio interference caused by ignition system, without expenses of shielded system. B-57 affords a wide range between pre-ignition and fouling; is resistant to lead attack. Safir plug is result of five years work; was developed for lightplanes; has CAA approval; has been field-service tested under rigid conditions. Further details may be had from SAFIR DIV., U.S. Quarry Tile Co., 217 4th Street NE, Canton, Ohio.



RANGEMASTER binoculars offer user 96 per cent more viewing area than other standard glasses. Magnification: 7 times; Objective lens: 35 mm; Linear field of view: 525 feet at 1,000 yards; Angular field: 10°. These binoculars are made of magnesium alloy and weigh just 29 ounces. Lens are magnesium fluoride hard-coated. Glasses may be had either individual or center focus. Leather case included. Cost: $125, plus tax, from D. P. Bushnell & Co., Bushnell Bldg., Pasadena, Cal.

NAVICOM

Raydist Plotting Board to USAF

All-Weather Division gets equipment for tracking plane positions

About a year ago a piece of new, highly accurate aircraft position measuring equipment was delivered to the USAF All-Weather Flying Division at Wright-Patterson AFB. It was known as *Raydist* (radio-distance) and its development was sponsored by the Air Navigation Development Board (ANDB). Some months later a flat surface plotting board (*see photo*) to track aircraft positions given by *Raydist* readings was also delivered to All-Weather.

Phase Comparison ▶ *Raydist,* being a phase-comparison system, gives accuracy to one part in 5,000, or approximately one foot per mile. The plotting board consistently shows to within a few feet of an airplane's actual position in space. The Air Force is using *Raydist* and the plotting board to evaluate several competing position and plotting systems, such as radar and ILS, of various radio frequencies and types. Current ranges used with *Raydist* are up to 175 miles, and the system operates on any frequency from 1 to 20 mc in the high frequency band.

Used in 1940 ▶ *Raydist* was pioneered by Charles E. Hastings, president and chief engineer of Hasting Instrument Co., Inc., Hampton, Va. Its first significant application was made by Hastings in 1940 to measure aircraft ground speed on test runs.

On the occasion of the delivery of the new electronic aircraft tracker to Air Force representatives at the factory, Hastings declared that with the addition of this plotting board, the *Raydist* system was the "logical successor" to present blind approach systems for aircraft. He estimated that *Raydist* was "about 10 times more accurate and more sensitive than any system used now to bring aircraft down through fog or murk to a blind landing."

Although it could be used to "talk down" an airplane to a blind landing (like GCA), Hastings said it could reach its efficiency as a blind landing system only with the addition of instruments in the aircraft similar to those the system uses on the ground (like ILS).

Plotting Board ▶ The plotting board is a large rectangular machine with sunken flat top. A cross-bar containing an ink-tipped stylus moves up and down and across the top of the machine in response to radio impulses. The function of the board is to reproduce on paper the movements and exact position of an aircraft in flight, landing and taking off.

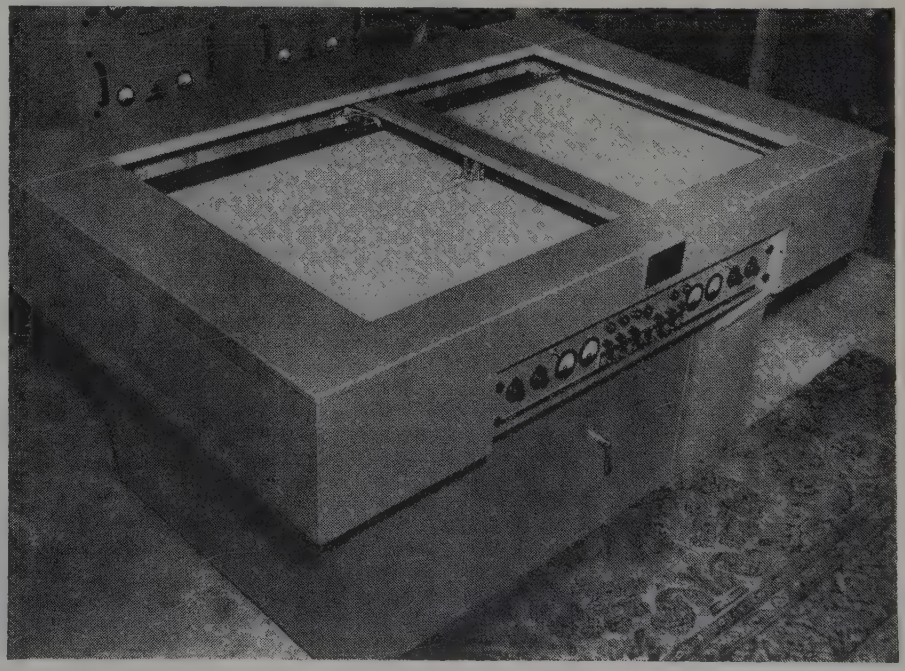
The instrument-panel part of the system is equipped with a number of dials, and measures by radio sending and receiving devices the position and movement of the plane and, by a more recent development, it provides an indication of its altitude as well.

Coverage ▶ *Raydist* systems can be set up to include the entire area within a given distance of a busy air terminal, or the systems can be expanded into an integrated air-navigation network thousands of miles in length.

The exact location of any aircraft coming within range of the system can be determined accurately and simply whenever a small radio transmitter in the plane is turned on for a moment. Continuous track is not necessary until within the terminal control area. Thus information regarding the location, direction and speed of a number of aircraft can be automatically plotted in the air traffic control centers, permitting the over-all traffic picture surrounding the airport or control center to be seen clearly at a glance and controlled.

Results of All-Weather flying divisions tests and evaluations of *Raydist* have not been released, but they are awaited with interest by all who are concerned with the problem of providing safer air travel.

PLOTTING BOARD reproduces on paper the movements and exact position of an aircraft in flight, landing and taking off. Dials on board give indication of airplane's altitude



Lear, Inc., Gives Free Classes in L-2 Service

Realizing the day is not too distant when autopilot installation on private and executive aircraft will be the rule and not the exception, Lear, Inc., has inaugurated a service school for its small L-2 autopilot. In attendance at the first session were 85 students representing 64 Lear distributors in 55 cities in the U.S., Canada, Europe and South America. Instruction was given in theory, installation and servicing of the Lear L-2 autopilot unit. The students were housed at no charge, and meals also were provided. Instruction, much of it by William Lear, was given at no charge.

Radar Simulator Tests Traffic Control Methods

Guesswork in radar control of air traffic is being eliminated and untried theories carefully tested by a huge radar simulator at CAA's Technical Development and Evaluation Center ("Tech D") at Indianapolis.

Knowledge of how best to use radar in controlling traffic near congested areas has heretofore been limited by lack of experimental information. To experiment with real aircraft during bad weather would be fantastically expensive.

Operation ▶ Effective traffic control tests can be achieved with the simulator, which is operated in a large room at Tech D. In testing various systems, as many as 13 "pilots" can "fly" their planes at one time under the direction of an "air traffic controller" at the far end of the room (*see photo*).

The path of each plane shows as a dot of light on a 144-square foot translucent screen, on which simultaneously is projected a map of the area under investigation. That shown in the photo is the Washington, D. C. area, where CAA's first experimental Radar Traffic Control Center has been in limited operation for some time.

With the aid of the simulator, complex problems can be worked out in a few hours. Merely by changing the projected map, radio ranges, fan markers, etc., can be "moved" to new locations on a trial basis, and the planes "flown" accordingly. This will be of great value, for example, in the preliminary studies necessary for setting up a Radar Traffic Control Center for the Metropolitan New York area, now in early planning status.

The radar simulator project is sponsored by the Air Navigation Development Board, a joint military-civil agency located at CAA Washington headquarters. The simulator is used to develop radar traffic control procedures for both military and civil aviation.

Here is how it operates. Each "pilot" sits at a console equipped with dials to control the "speed" and "heading" of his plane. He is connected by two-way telephone to the "air traffic controller" who sits behind the translucent screen at the end of the room.

The controller, watching the big "radar screen," directs the pilots to fly courses, speeds and altitudes in the same way he would direct traffic from an actual radarscope in a tower or ATC center.

The human element plays an important part in the tests, since there are times when the "pilots" misunderstand instructions, or make errors in carrying them out, just as real pilots sometimes make mistakes.

One of the "pilot positions" has been placed in a Link Trainer in a different part of the building to test pilot reactions to radar control under IFR conditions, and to determine how effectively pilots can carry out various types of

RADAR SIMULATOR, in operation at the CAA's Technical Development and Evaluation Center in Indianapolis, is being used to test heretofore untried theories of air traffic control

instruction.

The white spots representing the radar targets on the screen are supplied by a battery of projectors, each connected to a pilot console. Each change in speed, direction, etc., made by the "pilot" is faithfully translated, by means of a complex servo motor system, into a corresponding movement of the white dot.

The chief difficulty so far is that the simulator works too well. The projected "pips" are much brighter and clearer than on an actual radarscope, making the work of the "controller" easier than it would be in actual practice. Also, the projected white spots fail to leave electronic "trails" behind them, as they do on a real radarscope (face of a cathode ray tube).

Tech D is building equipment to overcome these difficulties by *televising* the large screen, and presenting the information to the controller on a standard radarscope.

Simple Airborne Transponder Missing Link in Radar Traffic Control Program

On January 22nd, when the weather was so soupy that an important flight of civil aviation leaders to Fort Bragg to see an Army aviation demonstration was cancelled, CAOA board chairman Cole H. Morrow seized the occasion to observe the recently inaugurated radar departure control at Washington National.

It is well known that large rain drops can play havoc with reception of radar pips on a scope, and it was so bad that morning that radar control was finally cancelled and the regular ANC traffic control procedures were put into effect. Two corporate aircraft were up in the soup when this happened.

Cole had been one of the group of civil aviation observers at the SWG-5 Operational Demonstration of radar traffic control principles at Wright-Patterson AFB in October, 1950. An airborne radar beacon (APN-19) was available in 60 per cent of the participating aircraft. This airborne transponder contained seven codes and worked with the CPS-6 (V Beam) and CPN-18 ground radars, both of which operate in the S-band, or super high frequency (SHF).

The airborne beacon was used to establish rapid and positive identification of aircraft so equipped, and was also used to intensify the radar echo from some aircraft which normally give a weak response (jets, Twin Beech and smaller types). It also helps radically during rain. Morrow watched both ground scopes from time to time and has never tired of telling all and sundry what a difference in radar reception it makes to have that relatively simple little gadget aboard.

The day following his observation of what rain could do to terminal area radar traffic control, Cole Morrow was asked to meet with the CAA's Aviation Development Advisory Committee (ADAC) (which is in process of being reorganized) and tell them about it. This he did, in no uncertain terms, and he also had a chance to tell Sam Saint, vice-chairman of SWG-5 and chief of ATA's Air Navigation & Traffic Control division, that this whole radar traffic control program will fall flat on its—er—ASR scope or something, unless we get that airborne transponder roadblock kicked away! For want of a nail the horseshoe was lost—and the battle.

CAA's TDEC (Tech. Dev. & Eval. Center) received an SL transponder prototype some months ago for testing, and a second was turned over to All-Weather Flying Division for modification to SS type. The first receives in S-band from ground radar and replies in L-band; the second receives and replies in S-band. Two more of the beacons have since been delivered, and all are capable of replying in four codes.

The hitch on the evaluation program has been the ground radar. The General Electric ASR-2 (airport surveillance radar) has been at TDEC for some time, but was not due to be installed until March 1st. Latest word is that GE engineers went to Indianapolis on February 1st and that installation has begun. A modification of ASR-2 to receive L-band pulses from the airborne beacon was to have been ready by late summer, but this too has been reported as under pressure for advanced delivery.

There's so much of this stuff that everybody wants as of yesterday that the only way to get a particular item is to keep blasting away.

Points for Pilots

1. Know your regulations, particularly Part 60 (Air Traffic Rules) and Administrative Regulation 620 (Security Control of Air Traffic).

2. Check the weather and NOTAMS before you file your flight plan.

3. Be sure you have current Aeronautical Charts appropriate to your flight.

4. Check your radio and navigation equipment before take-off.

5. Use your radio. It is your link with trained personnel on the ground.

6. Report your position along route of flight and indicate whether you are on an IFR or VFR flight plan.

7. When in doubt, contact any CAA station, center or tower in person or by radio for advice and assistance.

8. Close your flight plan. Failure to do so may trigger off an expensive search and rescue operation.

Wilcox 44OA Ready for Corporation Aircraft

Wilcox Electric Company, Inc., Kansas City, Mo. is currently making deliveries of its 44OA new and improved VHF communications system for the airlines and larger corporate aircraft.

The complete system includes a 50-watt transmitter (22 lbs. 6 oz.) high selectivity receiver (21 lbs. 4 oz.), and 14- or 28-volt power supply, with plug-in dynamotors (28 lbs. 7 oz.). Total weight is just over 72 lbs, installed on a compact equipment mount.

The system meets the specifications set up by Aeronautical Radio, Inc. (ARINC) for the airlines, and each unit (and the combination) has CAA type certification.

Both transmitter and receiver cover all 180 channels in the entire 118-136 mc aeronautical band (100 kc or 0.1 mc separation). However, the 44OA receiver, is for VHF communications only, unlike the Collins 51 R-2 and Bendix MN-85D, both of which provide 280 channels to include air navigation functions in the 108-111 mc band (ILS-VAR) and 112-117 mc (VOR or omnirange).

All transmitter and receiver functions, including frequency selection, are available by finger-tip remote control. The basic pilot's control switch is very compact and is expected to be popular with all aircraft pilots. The indicator dial is etched on a translucent material, illuminated from behind, reading directly in megacycles and tenths.

The receiver's frequency selector mechanism provides for 90 harmonic mode, hermetically sealed crystals, each serving two channels. The transmitter mechanism provides for 90 dual, harmonic mode crystals serving 180 channels. Only crystals for present requirements need be installed, leaving remaining capacity for future growth or changing requirements.

A simple, direct, harmonic mode crystal oscillator eliminates transmitted spurious radiations in the 118-136 mc band. Thus the possible interference generated by "crystal-saver" systems is eliminated, according to company claims.

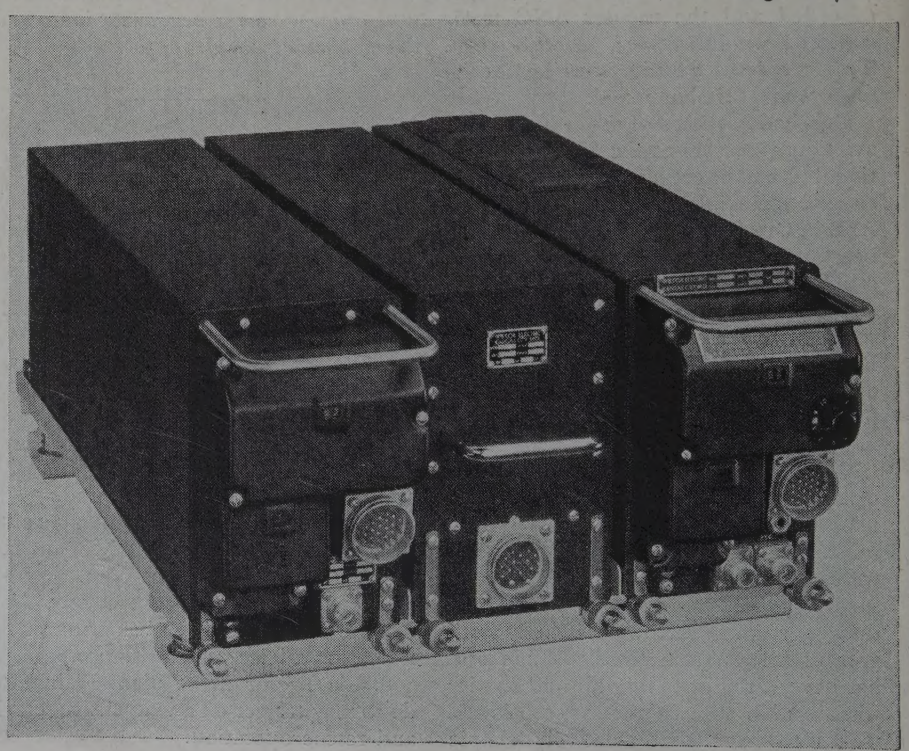
The 44OA is new, but is already being installed in the Eastern Air Lines fleet, Aloha Airline, Continental Charters, Miami, and among corporation aircraft operators, Procter & Gamble, Reynolds Metals and others.

R. P. Dutton to Collins Radio

R. P. Dutton, former Communications Superintendent of the Atlantic division of Pan American World Airways, has joined Collins Radio Company's aviation radio sales division with headquarters in their New York office at 11 West 42nd Street. Mr. Dutton is a veteran in transatlantic communications and has actively participated in many ICAO, IATA and other international conferences. He has a wide acquaintance in international aviation communications circles, and held a variety of communications posts with PAA.

Dutton will be charged with the responsibility of maintaining contact with users of Collins aviation radio communication and navigation equipment.

SYSTEM 44OA is Wilcox new VHF communications system for exec planes; weighs 72 pounds



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